II A

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 3, NUMBER 2
JANUARY 15, 1970

W70-00418 -- W70-00835

Selected Water Resources Abstracts is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the Clearinghouse for Federal Scientific and Technical Information (CFSTI) of the Bureau of Standards, U. S. Department of Commerce. It is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Resources Research, U. S. Department of the Interior, Washington, D. C. 20240. Annual subscription is $22.00 (domestic), $27.50 (foreign), single copy price is $3.00. Certain documents abstracted in this journal can be purchased from the Clearinghouse at the prices indicated in the entry. Prepayment is required.

CLEARINGHOUSE
FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION
U.S. Department of Commerce, Springfield, Va., 22151

SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 3, NUMBER 2
JANUARY 15, 1970

W70-00418 -- W70-00835

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources. WRSIC is not presently prepared to furnish loan or retention copies of the publications announced.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas. Centers, and their subject coverage, now in operation are:

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.

- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the FWPCA, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.

In cooperation with the Federal Water Pollution Control Administration, the following "centers of competence" have been established:

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Water Resources Scientific
Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

LAWS OF DISPERSION,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Mechanical and Aerospace Engineering.
Richard L. Peskin.
Water Resources Research Institute Report, Rutgers University, New Brunswick, N.J. Oct 20, 1969. 46 p.

Descriptors: *Dispersion, Energy transfer, Turbulence, Mixing, Suspension, Bubbles, Water properties.

Two problems on the laws of dispersion for materials such as small particles and gas bubbles in turbulent streams are considered. After discussing the mechanisms of single-particle dispersion, a statistical approximation model is used to calculate two-particle dispersion. Specifically, the Eulerian fluid velocity which appears in the equation of motion of a small particle is replaced by a random best estimate. This estimate is obtained by prediction techniques using specified statistical properties of the turbulence field. The second problem considered is that of gas bubble dispersion. An approximate analysis is used to estimate the spread of bubbles from a line source of bubbles. Buoyancy and turbulence inhomogeneity effects, which result in a bubble size segregation, are evaluated.
W70-00732

PATTERNS OF THE THERMAL REGIME OF THE SURFACE LAYER OF WATER,
For primary bibliographic entry see Field 02D.
W70-00741

02. WATER CYCLE

2A. General

GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W70-00440

HYDROGRAPH STUDY AND PEAK DISCHARGE DETERMINATION OF HAWAIIAN SMALL WATERSHEDS: ISLAND OF OAHU,
Hawaii Univ., Honolulu.
I-Pai Wu.
Hawaii Univ, Honolulu, Water Resources Res Center Tech Rep No 30, Mar 1969. 85 p, 9 fig, 2 tab, 11 ref, 3 append. OWRR Proj No B-003-HI.

Descriptors: *Rainfall-runoff relationships, *Hydrograph analysis, *Recession curves, *Small watersheds, *Hawaii, Infiltration, Unit hydrographs, Topography, Statistical methods, Regression analysis.
Identifiers: *Oahu.

Hawaiian small watersheds are unique in watershed hydrology because of the high infiltration rate, small size, and mountainous topography. The flood hydrograph, which has a short time to peak and small recession constant, can be expressed as a steep triangular shape. A peak discharge equation is derived from the concept of a triangular hydrograph and a linear storage of recession flow. The peak discharge equation can be shown as a very simple linear form, a function of time to peak and the surface runoff in inches. A linearity test between peak discharge and runoff has been made for Hawaiian small watersheds and a good linear relationship was found between peak discharge and surface runoff which is less than 6 inches not only for an individual small watershed but for watersheds of similar size. (Knapp-USGS)
W70-00449

SURFACE-WATER RESOURCES OF THE YOBE RIVER SYSTEM, NORTHERN NIGERIA, 1963-68,
Geological Survey, Washington, D.C.
B. E. Colson.
Geol Surv Open-file Rep, Jan 1969. 201 p, 6 fig.

Descriptors: *River systems, *Data collections, *Water utilization, *Hydrologic budget, Tributaries, Forecasting, Evaluation, Surveys, Water quality, Hydrogeology, Erosion control, Organizations, Gaging stations, Surface-groundwater relationships, Flow rates, Sediments.
Identifiers: *Nigeria, Yobe River system, Lake Chad.

This report describes the general hydrologic features of the Yobe River system, Nigeria, and presents hydrologic data on gage heights, daily discharge, and chemical quality and sediment content data for water samples at 18 stations in the system. Records for one site begin in 1958, but most records are for the 1963-1968 period. The Yobe (Komadugu) is tributary to Lake Chad and drains a 33,000 sq mi area in semiarid northern Nigeria. Less than 10% of the total surface runoff from the Yobe River system reaches Lake Chad, owing to evapotranspiration losses and to a much less extent by infiltration to groundwater storage. In the upper Yobe basin geologic controls limit groundwater development to shallow wells of low yield in many places and water supplies are obtained mostly from surface sources. The tributary Kano and Jemari Rivers have excellent quality water of low sediment load, but the Challowa River has a high sediment load. An estimated 15%, or more, of the rainy season runoff could be stored and would meet anticipated demands. (Lang-USGS)
W70-00456

SURFACE WATER AND RELATED CLIMATE FEATURES OF THE SAHIL SUSAH AREA, TUNISIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W70-00471

EVAPOTRANSPIRATION CLIMATONOMY: 1. A NEW APPROACH TO NUMERICAL PREDICTION OF MONTHLY EVAPOTRANSPIRATION, RUNOFF, AND SOIL MOISTURE STORAGE,
Wisconsin Univ., Madison. Dept. of Meteorology.
For primary bibliographic entry see Field 02D.
W70-00654

THE USE OF EXPONENTIAL FUNCTIONS WHEN CONSTRUCTING THE LAWS OF THE DISTRIBUTION OF GEOGRAPHICAL AND HYDROMETEOROLOGICAL PARAMETERS (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Meteorology; and Moscow State Univ. (USSR). Dept. of Climatology.
A. A. Dmitriev, and L. P. Uporova.
Russian text with English summary. Vestnik Moskov Univ, Ser 5, Geogr, No 4, p 100-105, July-Aug 1969. 6 p, 2 fig, 2 ref.

Descriptors: *Mathematical studies, *Hydrologic data, *Meteorological data, *Parametric hydrology, Probability, Statistical methods, Dispersion, Frequency analysis.
Identifiers: Exponential functions.

The use of a normalized orthogonal and exponential function for the study of the distribution of hydrometeorological and geographical parameters was investigated assuming certain types of distribution of parametric data. The study describes the possibility of the construction of some skew frequency curves by using a system of these orthogonal functions. Curves of some typical distribution laws are given and an approximate method for the evaluation of unknown parameters is presented. (Gabriel-USGS)
W70-00657

WATER BUDGET STUDIES IN KARST AQUIFERS,
McMaster Univ., Hamilton (Ontario). Dept. of Geography; and Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02F.
W70-00676

PHYSICAL INFLUENCES ON FLOW SERIAL CORRELATION,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W70-00723

2B. Precipitation

LAND USE ALONG A TROPICAL CLIMATIC BOUNDARY: THE WALAWE GANGA BASIN OF CEYLON,
National Academy of Sciences-National Research Council, Washington, D.C.
For primary bibliographic entry see Field 03B.
W70-00463

SOME METEOROLOGICAL REQUIREMENTS IN WATERSHED ENGINEERING RESEARCH,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 07A.
W70-00474

A CLIMATOLOGICAL BIBLIOGRAPHY OF THE SOUTH ATLANTIC OCEAN AREA, INCLUDING CERTAIN COASTAL COUNTRIES,
Environmental Technical Applications Center (Air Force) Washington, D.C.
For primary bibliographic entry see Field 10.
W70-00481

AN ANNOTATED CLIMATOLOGICAL BIBLIOGRAPHY OF ROMANIA,
Environmental Technical Applications Center (Air Force), Washington, D.C.
For primary bibliographic entry see Field 10.
W70-00482

RADAR-COMPUTED RAINFALL COMPARED WITH OBSERVATIONS FROM A DENSE NETWORK OF RAIN GAUGES,
Environmental Technical Applications Center (Air Force), Washington, D.C.
For primary bibliographic entry see Field 07A.
W70-00483

TRACTIONABILITY STUDY FOR THE LAOTIAN PANHANDLE,
Environmental Technical Applications Center (Air Force), Washington, D.C.
For primary bibliographic entry see Field 02G.
W70-00484

EARTHFLOW OCCURRENCE DURING HIGH INTENSITY RAINFALL IN EASTERN OTAGO (NEW ZEALAND),
Otago Univ., Dunedin (New Zealand). Dept. of Geography.
M. J. Crozier.
Eng Geol, Vol 3, No 4, p 325-344, Oct 1969. 10 p, 5 fig, 1 tab, 11 ref.

Descriptors: *Landslides, *Rainfall, *Erosion, Pore pressure, Soil water movement, Infiltration, Percolation, Seepage, Mass wasting, Rockslides.
Identifiers: *New Zealand, Otago.

The characteristics and effects of an unusually heavy rainstorm causing landsliding in eastern Otago, New Zealand are discussed. The storm produced up to 8 inches of rain in 48 hr during a month, which, over the last 20 yr, has had a mean of 2.03 inches. These weather conditions triggered numerous landslides in an area which is believed to have become progressively unstable over the last 100 yr. A theory for the progressive development of unstable land in the locality is outlined. It centers around the change of soil properties induced by a removal of the indigenous forest. The relevant morphological and geological characteristics of a typical earthflow are listed and an account is given of the observed processes of earthflow occurrence. (Knapp-USGS)
W70-00647

HYDROLOGICAL REQUIREMENTS FOR WEATHER RADAR DATA,
A. F. Flanders.
World Meteorol Organ/Int Hydrol Decade Proj Rep No 9, 1969. 16 p, 1 tab, 16 ref.

Descriptors: *Radar, *Precipitation (Atmospheric), *Precipitation gages, *Instrumentation, Network design, Precipitation intensity, Surveys, Research and development, Rainfall, Snowfall, Meteorology.
Identifiers: Radar precipitation gaging, Meteorological radar.

Direct quantitative measurement of the average precipitation depth over drainage units would be a valuable tool in hydrological forecasting. Precipitation measurement by means of ground-based weather radar is being investigated in a number of countries. This report gives a brief survey of hydrological requirements for weather radar data based on experience in the U.S.A. with the Weather Bureau's radar network, and traces the application made of radar data to hydrological forecast problems encountered by the U.S. Weather Bureau. (Knapp-USGS)
W70-00673

AGRICULTURAL METEOROLOGY IN ISRAEL,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 03F.
W70-00691

POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS: NORTHWEST INDIA, A CASE FOR STUDY,
Wisconsin Univ., Madison.
Reid A. Bryson, and David A. Baerreis.
American Meterological Society, Bulletin, Vol 48, No 3, p 136-142, March 1967. 3 fig, 20 ref.

Descriptors: *Weather modification, *Deserts, *Dust storms, *Precipitation (Atmospheric), Arid lands, Climatology, Meteorology, Vegetation effects, Vegetation establishment, Monsoons, Economic impact, Social aspects.
Identifiers: *India, *West Pakistan, *Rajputana Desert, *Rajasthan Desert, *Subsidence (Atmospheric), Archaeology, Intermittent occupation.

Field observations and theoretical studies indicate that dense dust over northwest India and West Pakistan is a substantial factor in development of subsidence over the Rajasthan Desert. In the absence of this dust, there would be less radiation divergence in mid-troposphere and thus, less subsidence and a deeper monsoon layer, with rains extending farther into the present desert area. Archaeological evidence suggests a long pattern of intermittent occupation with man playing an important part in making the desert. If man could establish a stablizing grass cover, there would be little blowing dust and the average subsidence would be reduced by perhaps one-third. This might result in more instability and increased showers during the day and increased dew formation on the grass at night. Social and economic consequences are outlined briefly. (Crouse-Arizona)
W70-00702

A CLIMATOLOGICAL EVALUATION OF PRECIPITATION PATTERNS,
Public Health Service, Washington, D.C.
For primary bibliographic entry see Field 04C.
W70-00740

2C. Snow, Ice, and Frost

THE EXCHANGE OF HYDROGEN ISOTOPES BETWEEN ICE AND WATER IN TEMPERATURE GLACIERS,
Iceland Univ., Reykjavik. Science Inst.
For primary bibliographic entry see Field 02K.
W70-00439

THREE-DIMENSIONAL SURGES AND RECOVERIES IN A NUMERICAL GLACIER MODEL,
Geological Survey, Tacoma, Wash.
William J. Campbell, and Lowell A. Rasmussen.
Canadian J Earth Sci, Vol 6, No 4, Part 2, p 979-986, Aug 1969. 8 p, 7 fig.

Descriptors: *Glaciers, *Surges, *Mathematical models, Regimen, Cryology, Rheology, Ice, Mountains, Frequency, Precipitation (Atmospheric), Slopes, Flow, Climates, Friction, Heat flow.
Identifiers: Glacier surges, Surging glaciers, Navier-Stokes equation.

To calculate glacier surges, the Navier-Stokes equation, integrated vertically to yield a 2-dimensional transport equation, is combined with the 3-dimensional continuity equation. By assuming a linear relation between volume transport and bottom shear stress, a system of numerically tractable differential equations is developed that contains a nonlinear surface slope term and a term in which horizontal frictional forces are stated explicitly. These equations, which are not based on perturbation analysis, are integrated directly on a high speed digital computer. The coefficient of each term in the flow equations is composed of physical parameters (gravity, density, viscosity); therefore, since no quantities such as ice velocities enter the equations, it is only necessary to specify an arbitrary bed configuration and a net-balance versus altitude curve to obtain a glacier solution. For 2 beds, valley and cirque, steady-state glacier solutions are found for a variety of bed and lateral frictional values. By reducing the bed friction coefficient for one year over the entire bed of the glacier, surges are induced in each of these cases. A reduction in bed friction to 5% of its original value yields a surge resembling typical observed surges. Interesting wave forms occur during the recovery. During the initial recovery, after the bed friction has been restored to its original value, height falls continue to occur even in the lower accumulation zone. The original steady-state shape is approached asymptotically, with total recovery taking hundreds of years. (Knapp-USGS)
W70-00443

SNOWY RANGE WATER RESOURCE OBSERVATORY (A Progress Report).
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 07C.
W70-00480

THERMAL STRATIFICATION IN THE ARCTIC OCEAN,
Oregon State Univ., Corvallis; and Naval Postgraduate School, Monterey, Calif.
V. T. Neal, S. Neshyba, and W. Denner.
Science, Vol 166, No 3903, p 373-374, Oct 1969. 2 p, 1 fig, 4 ref.

Descriptors: *Thermal stratification, *Arctic ocean, *Electronic equipment, Interfaces, Isotherms, Density currents, Heat flow, Mass transfer, Deep water, Methodology.
Identifiers: *Thermal structure, Vertical profiles, Deep sea research.

Sophisticated electronic systems now in use by oceanographers to obtain continuous temperature and salinity profiles show that the vertical temperature profile in the oceans may be complex. Fine scale vertical temperature measurements in an Arctic water column are described; they show the presence of several cascaded isothermal layers. Layers between depths of 300 and 350 meters range from 2 to 10 meters in thickness, while the temperature change between adjacent layers is approximately 0.026 deg C. The individual layers are isothermal to within plus or minus 0.001 deg C. (Lang-USGS)
W70-00638

TIDAL FLAT EROSION BY ICE AT LA POCATIERE, ST. LAWRENCE ESTUARY,
Department of Fisheries and Forestry, Sillery (Quebec).
For primary bibliographic entry see Field 02L.
W70-00640

GLACIATION OF THE RIVER BASINS OF THE LEFT TRIBUTARIES OF THE ALAZANI AND THE PIRIKITA ALAZANI (IN GEORGIAN),
T. V. Kopadze.
Published in Georgian with Russian and English summaries. Soobshch Akad Nauk, Gruz SSR, Vol 54, No 1, p 117-120, Apr 1969. 4 p, 4 ref.

Descriptors: *River basins, Glaciation, Rivers, Topography, Altitude, Geology, Sedimentary rocks, Erosion, Glacial drift, Glaciers.
Identifiers: *USSR, Georgian SSR, Eastern Caucasus.

The relief of the eastern Caucasus has been formed by glaciation to a large extent. The glaciation of the Wurm stage in this area can be subdivided into several cycles. The glaciers of the maximum Wurm stage, on both the northern and southern slopes of the Kakhetian Kavkazioni, reached an absolute height of 1800-2000 m. However, within the limits of Tushety, in the basin of the Pirikita Alazani River, the glaciation ended at the 7th cycle. (Gabriel-USGS)
W70-00669

HYDROLOGY OF FROZEN GROUND FLOODS,
Idaho Univ., Moscow. Water Resources Research Inst.
G. L. Bloomsburg, and S. J. Wang.
Available from the Clearinghouse as PB-187 269 $3.00 in paper copy, $0.65 in microfiche. Idaho Water Resources Research Institute, Research Technical Completion Report, June, 1969. 13 p. OWRR Project A-016-IDA.

Descriptors: *Hydrologic properties, Permeability, Porous media, *Soil properties, Frozen soils, Percolating water, Soil moisture.

A four year field and laboratory study of permeability of frozen soil is reported. The field studies involved temperature and moisture measurements over a two year period during which there were no runoff events when the ground was frozen. A rainfall simulator was constructed and used to a limited extent the second year of the study. The laboratory study involved measuring the permeability of frozen soil columns at various initial moisture contents. Air was used as a fluid to measure the permeability under isothermal conditions below 32 deg F. Data were obtained which relate the air permeability to the porosity of the soil and the moisture content or saturation at which freezing occurred. For the three soil types tested, it was possible to obtain impermeable conditions after freezing when the initial moisture content was in the neighborhood of the field capacity. The significant parameter affecting the permeability was 0 (1 - S) where 0 is the porosity and S is the saturation. The use of certain critical values of this parameter would enable a person to predict when the possibility of frozen ground floods exist by taking soil samples in the field. The critical values for various soils would have to be determined from field

permeability measurements. (Corey-Univ of Idaho)
W70-00721

PHYSICAL INFLUENCES ON FLOW SERIAL CORRELATION,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W70-00723

SNOWPACK MANAGEMENT,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
Henry W. Anderson.
IN Snow, Oregon State Univ, Water Resources Inst Seminar, WR 011.69, p 27-40, 1969.

Descriptors: *Snow management, *Watershed management, *Snowpacks, *Snowmelt, *Forestry, *Lumbering, Water supply, Floods, Evaporation, Condensation, Snow accumulation, Brush control, Mechanical control, Solar radiation, Advection, Streamflow, California, Colorado.
Identifiers: *Forest cutting patterns.

Summarizes results of research in California and Colorado on accumulation of snow, snowmelt, and disposition of snowmelt water as affected by forest cutting patterns, clearing of brushfields, and mechanical control of snow drifting. The implications to water yield and water supply are suggested. Revised estimates of increase in streamflow under three types of forest cuttings are given with increases the first year after cutting ranging from six inches in selection cut to 12 inches in strip cut. Duration of cutting affects on snow accumulation and soil moisture savings are given. Data are shown which indicate that snowmelt contribution to floodwaters may be mostly due to sensible heat of condensation during rainstorms, adding 2.7 inches of melt in a three day rain storm of 11 1/2 inches. Advection and condensation melting together added 4.1 inches and melt by rain 0.5 inches; thus snowmelt contributed 30 percent of the flood water. Differences in advection and condensation between large block-cut areas versus selection or strip-cut areas may make for significant differences in the snowmelt contribution to floodwaters between forest cutting methods.
W70-00763

2D. Evaporation and Transpiration

RESEARCH IN EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Coll. of Agriculture and Home Economics; and Nebraska Univ., Agricultural Experiment Station.
N. J. Rosenberg, K. W. Brown, T. A. Hales, P. C. Doraiswamy, and D. E. Sandin.
Horticulture Program Rep No 73. Nebr Univ Water Resources Res Inst Proj Completion Rep, July 1969. 153 p, 47 fig, 17 tab, 85 ref. OWRR Proj No A-001-NEB.

Descriptors: *Evapotranspiration, *Consumptive use, Lysimeters, Evapotranspiration control, Advection, Water balance, Water loss, Energy budget, Climatology, Instrumentation, Computer programs.
Identifiers: Evapotranspiration estimating.

A lysimetric research facility was constructed at the University of Nebraska Field Laboratory at Mead. A 6-acre field was equipped for irrigation. Two precision weighing lysimeters and meteorological instrumentation were assembled, tested and combined into functional systems. Data logging and instrumental control systems were developed and integrated for study of the physics of evapotranspiration processes in the natural environment. Evaporation from bare soil was studied during 1966 after installation of the lysimeters. Data were assembled on the magnitude and rate of evaporation from bare soil under summer and fall conditions and under conditions where the lysimeter served as an oasis. Maximum summer evaporative flux was found to be on the order equivalent to an energy consumption of 1.2 cal/sq cm. Maximum 24-hr evaporation during summer was about 0.31 inches. Nocturnal evaporation accounted for about 10% of the total evaporation from bare soil. Maximum evaporation from newly seeded soil in fall was about 0.12 inches/day, with a maximum evaporative flux energy consumption during any one day of about 0.5 cal/sq cm/min. Greenhouse and field trials of antitranspirant chemical effectiveness on alfalfa were conducted during 1967 and 1968. Results to date have been contradictory. (Knapp-USGS)
W70-00450

EVAPOTRANSPIRATION CLIMATONOMY: 1. A NEW APPROACH TO NUMERICAL PREDICTION OF MONTHLY EVAPOTRANSPIRATION, RUNOFF, AND SOIL MOISTURE STORAGE,
Wisconsin Univ., Madison. Dept. of Meteorology.
H. Lettau.
Res supported in part by Atmos Sci Lab, US Army Electronics Command, Fort Huachuca, Ariz. Monthly Weather Rev, Vol 97, No 10, p 691-699, Oct 1969. 9 p, 3 tab, 13 ref. Grant No DA-AMC-28-043-66-G24 (USAEC).

Descriptors: *Evapotranspiration, *Water balance, *Climatology, Mathematical models, Mathematical studies, Hydrologic budget, Soil moisture, Evaporation, Runoff.
Identifiers: Climatonomy.

A theoretical method is given to solve the water balance equation for land areas. A forcing function is essentially determined by the product of absorbed solar energy multiplied by monthly precipitation; the response function is soil moisture in its month-to-month variations. A very simple parameter is a nondimensional surface characteristics named the 'evaporivity' (which measures the fraction of absorbed insolation utilized during the month in the vaporization of concurrent precipitation) and a characteristic lag-time interval of the order of 2 to 3 mo to express 'delayed' evapotranspiration and runoff. The solution is obtained by a closed integration of the water balance equation and yields a coherent set of data on monthly evapotranspiration, runoff, levels of exchangeable soil moisture, and storage changes. For verification, area averages for the central plains and eastern region of North America are calculated and compared with several years of actual data analyzed and evaluated by Rasmusson. In spite of simplifying tentative assumptions used in the model calculation, the agreement between predicted and observed data is improved in comparison with results of the earlier prediction methods discussed by Rasmusson. (Knapp-USGS)
W70-00654

ADVECTIVE CONTRIBUTION OF ENERGY UTILIZED IN EVAPOTRANSPIRATION BY ALFALFA IN THE EAST CENTRAL GREAT PLAINS (U.S.A.),
Nebraska Univ., Lincoln. Agricultural Experiment Station; and Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
N. J. Rosenberg.
Agricultural Meteorology, Vol 6, No 3, p 179-184, May, 1969. 2 tab, 1 fig, 12 ref. OWRR Project A-001-NEB.

Descriptors: *Great Plains, *Advection, *Evapotranspiration, *Alfalfa, *Lysimeters, Evaporation pans, Nebraska, Arizona, California, Instrumentation, Heat Budget.

Lysimetric measurements of evapotranspiration from well-watered alfalfa crops in the east-central Great Plains show that advection of sensible heat contributes an important share of the energy consumed in evaporation. Daily and hourly evapotranspiration rates were at times as great as those recorded in arid Arizona and at semiarid Davis, California. The study was conducted on a lysimeter covered with 25 cm. high alfalfa located in a similarly covered 1 3/4 ha. experimental field. The soil in the lysimeter and surrounding area was at field capacity at the beginning of the 3 day study. Measurements were made of air temperature, dewpoint, wind speed and direction, solar radiation, net radiation and soil heat flux. Latent heat consumption exceeded the quantity of net radiation minus soil heat flux (Rn-S) by 140, 324, and 200 ly/day, respectively. (Crouse-Arizona)
W70-00690

PATTERNS OF THE THERMAL REGIME OF THE SURFACE LAYER OF WATER,
M. P. Timofeyev, and S. P. Malevskiy-Malevich.
Translated from Meteorologiya and Gidrologiya, No 2, 1967, p 57-65. Soviet Hydrology, Selected Papers, No 1, p 102-109, 1967. 7 p, 6 tab, 2 fig, 14 ref.

Descriptors: *Air-water interface, *Water temperature, Thermal stratification, Heat transfer, Thermal conductivity.
Identifiers: USSR.

The characteristics of the thin surface layer of water, which effects the different forms of heat exchange between the free water surface and the atmosphere, were studied. Experiments in a lake and in an evaporation pan measuring 20 m sq were conducted at the Valday Hydrologic Scientific Research Laboratory to determine the average thermal conductivity coefficient of the surface layer of water. Measurements in the lake were made from a hydrologic raft. The water surface temperature and effective radiation were measured by radiometer. The water temperature profile was measured with a resistance thermometer at depths of 2, 10, 50 and down to 500 cm. and penetrating radiation was measured at depths 2, 5, 10, 30, 50, 100 and 200 cm. Meteorological elements were also determined. The difference between temperature of the water surface (Ts) and the underlying layers (Tu): Ts - Tu were determined and also for data of Lakes Sevan and Baikal and the North Atlantic Ocean. Simular computations were done for various latitudes of the Pacific Ocean along 180 deg meridian. The conclusion was that under normal conditions, except during severe storms, the temperature gradient in the upper layer of water remains negative. Thermal conductivity characteristics of the surface layer were noted as stable, with a vertical gradient. (Guerrero-Vanderbilt)
W70-00741

COMPUTATION OF THE COMPONENTS OF THE THERMAL BALANCE OF PLANNED RESERVOIRS,
L. V. Nesina.
Translation from Transactions of the Voyey Kov Main Geophysical Observatory, (Trudy GGO), No 206, p 31-37, 1967. Soviet Hydrology, Selected Papers, No 1, p 183-189, 1967. 6 p, 2 tab, 4 fig, 13 ref.

Descriptors: *Reservoirs, *Heat balance, *Evaporation, Air temperature, Water temperature, Humidity, Wind velocity.
Identifiers: Thermal balance.

A method of determining the components of the thermal balance of planned reservoirs is examined. The method is based on computations of the water surface temperature, air temperature and humidity, and wind velocity over the surface of the reservoir. Examples of the computation of the components of the thermal balance are given for reservoirs of various dimensions and depths, and the results of the computations are analyzed. Conclusions were: (1) The depth of a reservoir has a significant effect on the components of the thermal balance, and (2) The dimension of a reservoir has an insignificant effect on the components of the thermal balance. (Guerrero-Vanderbilt)
W70-00744

2E. Streamflow and Runoff

STAGE-DISCHARGE CHARACTERISTICS OF A WEIR IN A SAND-CHANNEL STREAM,
Geological Survey, Washington, D.C.
D. D. Gonzalez, C. H. Scott, and J. K. Culbertson.
Geol Surv Water-Supply Pap 1898-A, 1969. 29 p, 17 fig, 1 tab, 6 ref.

Descriptors: *Stage-discharge relations, *Gaging stations, *Control, *Flow measurement, *Water levels, Weirs, Rio Grande, Model studies, Instrumentation, Water control, Alluvial channels, Stream gages.
Identifiers: Bernardo (N Mex).

An artificial control on a sand-channel stream must control both the resistance to flow and the bed elevation in order to stabilize the relation between water-surface elevation and water discharge. The weir (control structure) in the Rio Grande conveyance channel near Bernardo, N. Mex., was designed on the basis of a model study and field data. About 72% of the measurements used to define the base relation between water-surface elevation and water discharge falls within 5% of the mean relation for the prototype. The stage-discharge relation is not affected by backwater for values of submergence less than 90%. There is no consistent relation between the ratio of measured discharge to rated discharge and submergence for values of submergence greater than 90%. When the control is drowned out, or ineffective, the relation of water-surface elevation to water discharge is virtually the same as that prior to construction of the control for discharges greater than 1,500 cfs. When the control is not drowned out the water-surface elevation for a discharge of 2,000 cfs is greater than the minimum elevation, but is less than the maximum elevation that occurred at that discharge prior to construction. (Knapp-USGS)
W70-00418

WATER RESOURCES OF RANDOLPH AND LAWRENCE COUNTIES, ARKANSAS,
Geological Survey, Washington, D.C.
A. G. Lamonds, Marion S. Hines, and Raymond O. Plebuch.
Geol Surv Water-Supply Pap 1879-B, 1969. 45 p, 18 fig, 8 tab, 19 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Arkansas, Water supply, Streamflow, Water wells, Aquifers, Water quality, Water utilization, Hydrogeology, Hydrologic data, Data collections, Water yield.
Identifiers: Randolph County, Lawrence County (Ark).

Water is used at an average rate of almost 27 mgd in Randolph and Lawrence Counties, and quantities sufficient for any foreseeable use are available. Minimum recorded flows of 4 streams (Black, Current, Eleven Point, and Spring Rivers) exceeded 200 cfs, or 129 mgd 95% of the time. Water supplies can be obtained without storage from the larger streams in the area. Many of the smaller streams in the Interior Highlands also have large water-supply potential because of the excellent impoundment possibilities. Most of the water in the 2 counties is obtained from groundwater reservoirs in the Coastal Plain. Wells that tap alluvial deposits of Quaternary age commonly yield 1,000 gpm. However, the water often is unsuitable for many uses unless treated to remove hardness, iron, and manganese. Wells in the Interior Highlands generally are less than 200 ft deep and yield 10 gpm, or less. Groundwater in the Interior Highlands is very hard and is more susceptible to local bacterial contamination than is groundwater in the Coastal Plain. However, with proper sanitary safeguards against contamination and with treatment for reduction of hardness, groundwater in the Interior Highlands is suitable for most uses. (Knapp-USGS)
W70-00420

GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
Geological Survey, Washington, D.C.
D. M. Thomas, and M. A. Benson.
Geol Surv Open-file Rep, 1969. 45 p, 16 fig, 11 tab, 18 ref.

Descriptors: *Rainfall-runoff relationships, *Runoff, *Runoff forecasting, *Statistical models, Regression analysis, Correlation analysis, Topography, Climates, Rainfall, Streamflow, Streamflow forecasting.
Identifiers: *Drainage basin analysis.

Statistical multiple-regression analyses provide a generalized definition of the natural streamflow in four widely separated regions of the eastern, central, southern, and western areas of the United States. In each study region, every long-term essentially natural streamflow record was characterized by 71 or more flow indices. These indices represented magnitudes of high, low, and medium flow, topography, climate, and also the distributions of flows in time. Multiple-regression analyses then defined the relation between each flow characteristic and the drainage basin characteristics. Streamflow characteristics can be defined more accurately in the humid eastern and southern regions than in the more arid western and central regions, medium flows can be more accurately defined than high flows, and low flows can be only weakly defined. Standard deviations of monthly and annual flows were found to be significantly related to basin characteristics. Some indices of flow distributions in time (serial correlation and skew coefficients) could better be described by regional averages. Regression relations may be used to estimate many natural-flow characteristics at any site in the study regions. In addition, the knowledge of basin characteristics provides a firm technical basis for modifying and improving the existing streamflow data-collection system. (Knapp-USGS)
W70-00440

HYDROGRAPH STUDY AND PEAK DISCHARGE DETERMINATION OF HAWAIIAN SMALL WATERSHEDS: ISLAND OF OAHU,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 02A.
W70-00449

SURFACE-WATER RESOURCES OF THE YOBE RIVER SYSTEM, NORTHERN NIGERIA, 1963-68,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02A.
W70-00456

HYDROLOGIC EFFECTS OF THE EARTHQUAKE OF MARCH 27, 1964, OUTSIDE ALASKA,
Geological Survey, Washington, D.C.
Robert C. Vorhis.
Geol Surv Prof Pap 544-C, p C1-C54, 1967. 54 p, 24 fig, 7 tab, 63 ref.

Descriptors: *Earthquakes, *Alaska, *Water level fluctuations, *Data collections, Surface waters, Groundwater, Lakes, Streams, Water wells, Aquifers, Seismic waves, Seiches, Tsunamis, Hydrologic data, Hydrogeology.
Identifiers: Earthquake hydrologic effects, Seismic seiches, Hydroseisms.

The Alaska earthquake of March 27, 1964, had widespread hydrologic effects throughout practically all of the United States. More than 1,450 water-level recorders, scattered throughout all the 50 States except Connecticut, Delaware, and Rhode Island, registered the earthquake. The earthquake is also known to have registered on water-level recorders on wells in Canada, England, Denmark, Belgium, Egypt, Israel, Libya, Philippine Islands, South-West Africa, South Africa, and Northern Territory of Australia. The Alaska earthquake is the first for which widespread surface-water effects are known. The effects were recorded at stations on flowing streams, rivers, reservoirs, lakes, and ponds. Most of the fluctuations recorded can be referred to more precisely as seismic seiches; however, a few stations recorded the quake as a minor change in stage. The largest recorded seiche outside Alaska was 1.83 ft on a reservoir in Michigan. The next largest was 1.45 ft on Lake Ouachita in Arkansas. The largest fluctuation in a well was 23 ft registered by a pressure recorder near Belle Fourche, S. Dak. Fluctuations of more than 10 ft were reported from wells in Alabama, Florida, Georgia, Illinois, Missouri, and Pennsylvania. A 3.40 ft fluctuation was recorded in a well in Puerto Rico. (Knapp-USGS)
W70-00467

CORRELATION AND ANALYSIS OF WATER-TERMPERATURE DATA FOR OREGON STREAMS,
Geological Survey, Washington, D.C.
A. M. Moore.
Geol Surv Water-Supply Pap 1819-K, p K1-K53, 1967. 53 p, 10 fig, 1 plate, 6 tab, 7 ref.

Descriptors: *Water temperature, *Correlation analysis, *Streamflow, *Surveys, *Oregon, Water quality, Thermometers, Surface waters, Forecasting, Data collections, Hydrologic data.
Identifiers: Oregon stream water temperatures, Thermographs.

Procedures are developed to correlate spot observations of water temperature with a representative thermograph record to estimate monthly means and extremes at the site where the spot observations were made. In general, these synthetic figures represent probable water temperatures at the spot-observation site during the period of record for the thermograph site. Tests indicate that the average errors in the estimates of monthly means and extremes are about 1 deg and 2 deg, respectively in the Oregon streams measured. The correlations are useful in assessing the effect of reservoirs on downstream water temperatures. The accuracy of the instruments and the methods used by the Geological Survey result in water-temperature records that are considered to be accurate within about 1 deg. Because water temperature in a given month varies from year to year, 2 rough guides are developed to assist in appraising short-term records with respect to long-term means and extremes of water temperature. The cold summer of 1955 and the warm summer of 1958 contain extremes that represent at least 25-year events. During the summer months, water temperature varies considerably even during one day. The amount of diurnal fluctuation can be significant and, in natural streams, depends largely on the amount of solar radiation absorbed, the amount of water to be warmed or cooled, and the amount and location of contributory spring flow. The maximum diurnal fluctuation at 129 thermograph sites is shown in tabular form. This listing can be used to estimate maximum diurnal fluctuation of water temperature in streams for which no thermograph records are available. (Knapp-USGS)
W70-00470

SURFACE WATER AND RELATED CLIMATE FEATURES OF THE SAHIL SUSAH AREA, TUNISIA,
Geological Survey, Washington, D.C.
L. C. Dutcher, and H. E. Thomas.
Geol Surv Water-Supply Pap 1757-F, p F1-F40, 1967. 40 p, 10 fig, 4 plate, 12 ref.

Descriptors: *Water supply, *Climates, *Surface waters, Runoff, Streamflow, Water resources, Arid lands, Rainfall-runoff relationships, Irrigation water, Municipal water.
Identifiers: Sahil Susah area (Tunisia).

The water supplies available to the people of central Tunisia are discussed. About 80% of the areas people inhabit the Sahil Susah (coastal area) and

the bordering Low Steppe. These lowlands receive water directly by precipitation and also by surface and underground flow from the High Steppe and the mountains. The median annual precipitation upon the Sahil and Low Steppe is about 280 mm which is less than one-fourth of the potential annual evaporation rate, and even in the winter 'rainy' season precipitation is less than half the evaporation rate. Thus on the basis of averages there is a net water deficiency throughout the year. In about 10% of the past 60 yr, precipitation has been great enough to sustain nonirrigated agriculture. In nearly 50% of the years, precipitation has contributed so little water to the soil that most crops not close enough to the coast to benefit from the nocturnal humidity there would fail without irrigation. The temporary excesses in precipitation provide occasional surpluses of water. Available records indicate that the streams draining the mountain range on the northwest (Dorsale) in central Tunisia have high maxima and flash-flood runoff but negligible flow in rainless periods. High evaporation losses, increasing salinity, sediment accumulation in reservoirs, and lack of suitable sites for dams or reservoirs are formidable handicaps to surface storage. For perennial supply, the surface flow should be stored in suitable groundwater reservoirs from which it could be pumped out as needed. (Knapp-USGS)
W70-00471

HYDROLOGIC DATA FOR THE OAK RIDGE AREA, TENNESSEE,
Geological Survey, Washington, D.C.
William M. McMaster.
Geol Sur Water-Supply Pap 1839-N, p N1-N60, 1967. 60 p, 21 fig, 13 tab, 36 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Surveys, *Tennessee, Streamflow, Low flow, Aquifers, Water yield, Water quality, Water utilization, Hydrogeology, Hydrologic data, Data collections.
Identifiers: *Oak Ridge (Tenn).

The Oak Ridge, Tenn., area is abundantly supplied with water. Annual rainfall ranges from 46 inches in the northeastern part of the area to more than 58 inches in the northwestern part; areal mean rainfall is 51.2 inches. Streamflows equaled or exceeded 90% of the time range from 0.04 cfsm for streams draining areas underlain entirely by sandstone and shale to 0.58 cfsm for streams draining areas underlain mostly by dolomite and limestone. The Knox Dolomite is the principal aquifer of the area; several large springs flow from the Knox, the largest of which is Bacon Spring, which has a mean discharge of about 3.8 cfs. Groundwater is not adequate as a source of large supply. It is estimated that the average well in the area would yield not more than 10 gpm and that very few wells would yield more than 50 gpm. In general, the water in streams in the Oak Ridge area is moderately hard to very hard and has a low content of sodium, potassium, and chloride. Four streams receive industrial or municipal wastes which alter their chemical quality. Several of the small streams in the Oak Ridge area are used for waste disposal, and one is used as a part of an arboretum. Groundwater development is small; at present, several springs are used for community or utility district supplies. Very large supplies of surface water from the Clinch River are presently developed in the area. Most of this supply is used by U.S. Atomic Energy Commission and Tennessee Valley Authority facilities. (Knapp-USGS)
W70-00476

RUNOFF FROM SMALL PEATLAND WATERSHEDS,
Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab.
Roger R. Bay.
J Hydrol, Vol 9, No 1, p 90-102, Sept 1969. 13 p, 6 fig, 1 tab, 7 ref.

Descriptors: *Runoff, *Water storage, *Bogs, *Minnesota, *Low flow, Recession curves, Rainfall-runoff relationships, River regulation, Hydrographs, Streamflow forecasting, Precipitation (Atmospheric), Infiltration, Water yield, Small watersheds.
Identifiers: Peat bogs, Bog watersheds.

Runoff was measured on 4 forested bog watersheds in northern Minnesota for 5 years. The experimental basins ranged in size from 24 to 130 acres and included both organic and mineral soils. Annual runoff was not evenly distributed. Spring runoff, from the beginning of flow in late March to the 1st of June, accounted for 66% of total annual water yield. Summer and fall runoff was normally very low and ceased on most of the bogs during each summer. Annual peak rates of discharge were low and recessions were long, indicating the bogs were effective as storage areas for short-term runoff. However, they were not effective as long-term storage areas or regulators of streamflow. (Knapp-USGS)
W70-00675

SURFACE WATER IN THE ERIE-NIAGARA BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
W. E. Harding, B. K. Gilbert, and R. M. Beall.
NY State Water Resources Comm Basin Planning Rep ENB-2, 1968. 118 p, 42 fig, 6 plate, 16 tab, 20 ref, append.

Descriptors: *Streamflow, *Surface waters, *New York, *Data collections, *Hydrologic data, Surveys, Gaging stations, Floods, Hydrographs, Draft-storage curves, Precipitation (Atmospheric), Runoff.
Identifiers: Erie-Niagara Basin (NY).

The Erie-Niagara basin contains about 2,000 sq mi in western New York State. The drainage systems of the area discharge into Lake Erie and the Niagara River at an average rate of about 1,730 mgd. Annual precipitation ranges from about 32 to 44 inches. Evapotranspiration losses account for about 20 inches of water a year and the streams have an average annual runoff of about 18 inches. Mean annual runoff in the area increases as a function of the direct relationship between precipitation and elevation of the land surface; therefore, a map on a topographic base was developed from which mean annual runoff can be estimated for any stream in the area. Other maps present the regional distribution of flow at the 50, 90, and 99% duration points. Low-flow frequency analyses show the minimum flows expected to recur at various intervals of time for periods of 1, 7 and 30 consecutive days. Studies of high flows provided the basis for a regional analysis of flood frequency for streams with drainage areas larger than 10 square miles. Overbank flooding in the Erie-Niagara basin is most extensive in the Tonawanda Creek basin. Many floods are the result of the formation of ice jams, both in stream channels and at the mouths of streams entering Lake Erie, and are not necessarily caused by unusually high streamflows. (Knapp-USGS)
W70-00689

RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research and Regional Survey.
K. D. Woodyer, and P.M. Fleming.
In: G A Stewart, Ed, Land Evaluation Papers of a CSIRO Symposium in Cooperation with UNESCO August 26-31, 1968, Macmillan of Australia, p287-298, 1968. 3 fig, 2 tab, 25 ref.

Descriptors: *Stream flow, *Discharge measurement, *Peak discharge, *Watersheds (Basins), *Stage-discharge relations, Mannings Equation, Frequency, Small watersheds, Estimating, Data collections.
Identifiers: *Australia, *New South Wales, Queensland.

This paper examines the feasibility of assessing stream flow on the basis of a reconnaissance survey of streams from small catchments of less than 100 sq. miles. Large sums of money are expended on numerous small works, such as road bridges and culverts, where time and money are not available for collection of long term stream flow data. Bankfull level was identified for streams in New South Wales on the basis of channel monopoly and vegetation. The data collected showed bankfull frequency to be a promising index for estimation of discharge-frequency relationships. A fixed frequency technique appears best suited for extrapolating from the base flood frequency. This method does not require rainfall observations. It represents an integration of all catchment characteristics. (Crouse-Arizona)
W70-00698

HYDROLOGY OF FROZEN GROUND FLOODS,
Idaho Univ., Moscow. Water Resources Research Inst.
For primary bibliographic entry see Field 02C.
W70-00721

PHYSICAL INFLUENCES ON FLOW SERIAL CORRELATION,
Washington Univ., Seattle. Dept. of Civil Engineering.
William J. Stolte, and Thomas H. Campbell.
Technical Report No 27. Available from the Clearinghouse as PB-187271, $3.00 in paper copy, $0.65 in microfiche. Completion Report, Washington Water Research Center, June 1969. 97 p, 27 fig, 4 tab, 34 ref. OWRR Project A-020-WASH.

Descriptors: *Runoff, Hydrology, Streamflow, Synthesis, Washington, Contours, Water storage, Snowmelt.

The effects of basin geometry and water storage capacity, rainfall, snow accumulation, and snowmelt on the lag-one monthly and annual serial correlation in the streamflow of Western Washington are examined by means of contouring and multivariate analyses. It is found that rainfall, snow accumulation, and snowmelt strongly influence the variation in the monthly flow serial correlation from basin to basin while the corresponding influence of basin geometry and water storage capacity is quite weak. The effect of these factors on the annual flow serial correlation is indirect and difficult to explain.
W70-00723

STATISTICAL ANALYSIS OF MEANDERING RIVER GEOMETRY,
Purdue Univ., Lafayette, Ind.
T. P. Chang, and G. H. Toebes.
Available from the Clearinghouse as PB-187 273, $3.00 in paper copy, $0.65 in microfiche. Purdue University Water Resources Research Center Technical Report No 7, June 1969. 162 p, 16 tab, 46 fig, 56 ref. OWRR Project A-003-IND.

Descriptors: *Meanders, *Channel morphology, Flood plains, Geomorphology, Rivers, Stream erosion, River beds, Thalweg, Profiles, Channel discharge, Bank stability, Channel shape, Channel depth, Channel width.
Identifiers: Wabash River, White River.

An investigation of the geometry of two natural meandering rivers, the Wabash River and the White River in Indiana, is described. Local curvature series were used to describe the meandering intensity. The power spectra of local curvature series were adopted to characterize the meander wavelengths. Relationships between absolute curvature, width, thalweg depth and cross sectional area have been suggested by their cross-correlation functions and cross-spectra. Two groups of factors: (1) geology and soil; (2) flow rate and channel

slope were postulated to be major factors to affect the meander planform for the rivers studied. A program to analyze the non-stationary data has been developed and applied to the curvature series. It appears to provide an objective way to describe details of a meandering river.
W70-00725

2F. Groundwater

WATER RESOURCES OF RANDOLPH AND LAWRENCE COUNTIES, ARKANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W70-00420

GROUND-WATER CONDITIONS IN McMULLEN VALLEY, MARICOPA, YUMA AND YAVAPAI COUNTIES, ARIZONA,
Geological Survey, Phoenix, Ariz.
P. C. Briggs.
Ariz State Land Dep Water-Resources Rep No 40, July 1969. 31 p, 9 fig, 4 tab, 2 ref, append.

Descriptors: *Groundwater, *Arizona, *Water level fluctuations, *Aquifers, Alluvium, Water yield, Water supply, Water quality, Irrigation water, Hydrologic data, Data collections.
Identifiers: McMullen Valley (Ariz).

Pumping of groundwater in McMullen Valley, Arizona is concentrated mainly in two areas - the Salome-Wenden area, which is near the outlet of the valley, and the Aguila area, which is about 25 miles farther upstream. In the Salome-Wenden area about 8,000 acre-ft of groundwater was withdrawn in 1957 and about 40,000 acre-ft was withdrawn in 1965; in the Aguila area 13,000 acre-ft was withdrawn in 1957 and 50,000 acre-ft was withdrawn in 1965. The withdrawal has caused water-level declines, changes in the flow pattern, and a decrease in the amount of groundwater in storage. Near Aguila, the water-level decline was more than 70 ft, and northeast of the Wenden area the decline was as much as 60 ft in the 7-year period 1958-65. In an area in Harrisburg Valley southeast of Salome there was no net change in water level in the 7-year period. Rises in water level, which offset declines, probably were caused by recharge from the surface water ponded behind a flood-control dam. In general, the ground water in McMullen Valley is well suited for irrigation because of the low dissolved-solids content, but in places the different dissolved constituents limit its use, depending on the soil type and crop being grown. The fluoride content of the water, however, is from 2 to 10 times the maximum recommended for drinking water. (Knapp-USGS)
W70-00426

OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
For primary bibliographic entry see Field 02K.
W70-00428

HYDROLOGY OF SOUTH BONAIRE, N. A. - A ROCK SELECTIVE DOLOMITIZATION MODEL,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geology.
R. C. Murray.
J Sediment Petrol, Vol 39, No 3, p 1007-1013, Sept 1969. 7 p, 6 fig, 9 ref.

Descriptors: *Diagenesis, *Limestones, *Dolomite, Hydrogeology, Aquifers, Evaporation, Groundwater movement, Water circulation, Karst, Chemical reductions, Water chemistry, Sea water.
Identifiers: *Dolomitization, *Netherlands, Antilles.

Study of the hydrology of the south end of the island of Bonaire, Netherlands Antilles, indicates that flow of fresh sea water onto land takes place through permeability conduits in the underlying rock and emerges as numerous springs. Reflux of some heavy brine is probably continuously taking place because of gravitational instability. In addition, evidence suggest a major annual reflux event in early summer that causes a significant loss of heavy brine. This annual event is controlled by the total pressure of the brine exerted at the level of an impermeable clay layer within the recent sediments being greater than the pressure exerted by the sea water at equivalent level. This annual return flow of brine moves through some of the same permeability conduits that supply fresh water through most of the year. Dolomite formed by such a hydrology should be confined to the permeability paths underneath an evaporite sediment in older rocks. This pattern of rock-selective or permeability-controlled dolomitization may be common in ancient rocks. (Knapp-USGS)
W70-00441

REDUCING LAND SUBSIDENCE IN THE WILMINGTON OIL FIELD BY THE USE OF SALINE WATERS,
Long Beach Dept. of Oil Properties, Calif.
For primary bibliographic entry see Field 05G.
W70-00447

LIMESTONE HYDROLOGY IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
Geological Survey, Washington, D.C.
G. K. Moore, C. R. Burchett, and R. H. Bingham.
Tenn Dep Conserv, Div of Water Rep, 1969. 58 p, 29 fig, 3 plate, 2 tab, 32 ref.

Descriptors: *Groundwater, *Karst, *Carbonate rocks, *Tennessee, Water wells, Groundwater movement, Water supply, Water yield, Permeability, Porosity, Hydrologic data, Data collections, Hydrogeology, Water levels, Springs, Recharge.
Identifiers: Stones River basin (Tenn).

The available evidence indicates that the solution cavities of the limestones of the Upper Stones River Basin, Tennessee range from a fraction of an inch to several inches high, from several tens of feet to several hundred feet wide, and from a fraction of a mile to several miles long. The hydrographs of 4 observation wells indicate that recharge is limited to specific areas, and that solution cavities function only as pipelines to carry water from the recharge area to the discharge area. Nearly all recharge and discharge occurs through open joints. Sinkholes are important recharge centers. Groundwater moves generally from the uplands to the streams. A map of groundwater levels in the basin does not reflect hydraulic gradients within individual solution cavities except across short distances. Instead, the map shows the water-level differences between essentially horizontal solution cavities at various depths. Some solution-cavity segments are joint controlled. Also, slightly higher well yields are obtained where thick soils are developed along joints. Joint direction and soil thickness should be considered in selecting test-well locations. (Knapp-USGS)
W70-00451

HYDROLOGY OF CARBONATE ROCK TERRANES, A REVIEW-WITH SPECIAL REFERENCE TO THE UNITED STATES (PART 1),
Geological Survey, Washington, D.C.; and Geological Survey, Raleigh, N.C.
V. T. Stringfield, and H. E. LeGrand.
J Hydrol, Vol 8, No 3, p 349-376, July 1969. 28 p, 4 fig.

Descriptors: *Hydrogeology, *Carbonate rocks, *Karst, *Reviews, Caves, Drainage effects, Groundwater movement, Limestones, Subsurface drainage, Topography, Geology.
Identifiers: Karst hydrology.

Limestone and other carbonate rocks are characterized by many unusual features and extreme conditions, either involving the hydrologic system within them or wrought by hydrologic conditions on them or through them. The need for knowing the specific geologic and hydrologic conditions at various places in limestone terranes, as well as the variations in hydrologic conditions with changing conditions and time, has resulted in many published reports on local areas and on special topical problems of limestone hydrology. Many of these reports have been used to advantage. The concept that secondary permeability is developed by circulation of water through openings with the accompanying enlargement of these openings by solution is now universally accepted in limestone terranes. Emphasis is placed on the hydrogeologic framework, or structural setting, in relation to the ease or difficulty of water to move from a source of recharge, through a part of the limestone, to a discharge area. Parts of the limestone favored by circulating ground water tend to develop solution openings, commonly in the upper part of the zone of saturation; as base level is lowered (sea level or perennial stream level), the related water table lowers in the limestone leaving air-filled caverns above the present zone of saturation in sinkhole areas. Reconstruction of the geologic and hydrologic history of a limestone area aids in determining the extent of development and the positions of fossil and present permeability. References are made to the hydrology of many limestone regions, especially those of the United States. (Knapp-USGS)
W70-00454

RESULTS OF SUBSURFACE EXPLORATION IN THE MID-ISLAND AREA OF WESTERN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Albany, N.Y.
Julian Soren.
Geol Surv Open-file Rep, July 1969. 90 p, 4 fig, 6 plate, 2 tab, 19 ref, append.

Descriptors: *Water resources, *Water supply, *Groundwater, *Surveys, *New York, Aquifers, Water levels, Water quality, Hydrologic data, Data collections, Hydrogeology, Water wells, Water level fluctuations, Hydrographs, Glacial drift.
Identifiers: Long Island (NY).

The mid-island area of western Suffolk County, Long Island, N.Y., is an area of about 140 sq mi which extends from the western border of the county to Lake Ronkonkoma. A program of test drilling and data collection was undertaken in 1963 to obtain information on the local geohydrology. Results of the work show that: the area is underlain by thick unconsolidated aquifers of moderate to high permeability; the water in the aquifers is of good quality for domestic and industrial uses; and sufficient groundwater of good quality should be available for at least several decades. Groundwater pumping in the area increased greatly to maintain adequate supplies for the growing population. In 1968, about 33 mgd was pumped, which was an increase of about 2.5 times the average pumpage in 1958. From 1903 to 1968, the water-table decline ranged from about 5 ft, in the eastern part of the area, to as much as about 40 ft, in the western part. The decline of the water table reflects the loss of about 30 billion gallons of groundwater in storage. An additional loss of groundwater in storage is anticipated as a result of increased pumpage and increased urbanization. (Knapp-USGS)
W70-00455

GEOLOGY OF THE REGOLITH AQUIFERS OF THE NISHNABOTNA BASIN,
Iowa State Univ., Ames. Dept. of Earth Sciences.
Lyle V. A. Sendlein, Donald E. Henkel, and Keith Hussey.
Iowa State Univ Water Resources Res Inst Proj Completion Rep, June 30, 1968. 29p, 6 fig, 42 ref. OWRR Proj No A-012-IA.

Descriptors: *Hydrogeology, *Hydrologic budget, *Aquifers, *Glacial drift, *Iowa, Groundwater movement, Mapping, Surveys, Geology, Sands, Gravels.

Identifiers: Nishnabotna Basin, Buried valleys.

In the analysis of the water budget of basins the one variable generally assumed to be constant is groundwater inflow and outflow. An investigation was made to evaluate the validity of this assumption in a glacial terrain underlain by a bedrock valley system. With the integrated use of geologic and geophysical data a major bedrock valley, the northern extension of a major buried valley system of Missouri was mapped. Sand and gravel deposits were found in segments of the buried valley and as a basal drift unit on the bedrock upland surface. Bedrock which subcrops in the basin is Pennsylvanian in the southern half both on the upland and in the buried valley. In the northern portion it is Cretaceous on the upland and Pennsylvanian in the valleys. The application of the seismic refraction electrical resistivity methods proved valuable and economical. The full report is available through the Iowa State Water Resources Research Institute, Ames, Iowa. (Knapp-USGS)
W70-00458

FORCES ACTING UPON THE SOLID PHASE OF A POROUS MEDIUM,
Agricultural Research Service, Madison, Wis.
For primary bibliographic entry see Field 02G.
W70-00459

GROUNDWATER RESOURCES OF MONMOUTH COUNTY, NEW JERSEY,
Geological Survey, Trenton, N.J.
Leo A. Jablonski.
N J Div Water Policy and Supply Spec Rep No 23, 1968. 117 p, 27 fig, 5 tab, 32 ref.

Descriptors: *Water resources, *Groundwater, *New Jersey, Surveys, Data collections, Hydrologic data, Aquifers, Water wells, Water yield, Water quality, Saline water intrusion, Hydrographs, Hydrogeology, Duration curves.
Identifiers: Monmouth County (NJ).

Monmouth County includes an area of 538 sq mi in east-central New Jersey. The climate is characteristized by moderate temperature, moderate humidity, and moderate precipitation. Groundwater constituted about 50% of the total water use in 1958. The daily withdrawal of groundwater was at an average rate of 21.6 mgd in 1958 and about 32 mgd in 1965. The water demand is expected to increase to about 133 mgd by the year 2000. An anlaysis of streamflow records for the period 1932 to 1950 suggests that, excluding the Raritan and Magothy Formations, the major aquifers that occur under water-table conditions in the county discharge an average of about 178 mgd to streams. Because salt water has been found in the lower parts of these formations in Ocean County, further development should proceed watchfully to assure that salt water does not threaten existing supplies. Aquifers in the Raritan and Magothy Formations and the Englishtown Formation supplied 76% of the groundwater used in 1958. These aquifers, in conjunction with the Wenonah Formation and Mount Laurel Sand of Late Cretaceous age, are capable of providing relatively large yields to wells. The average yield of 63 large-diameter wells tapping these aquifers is 580 gpm, at depths ranging from 100 to 1,140 ft. In general, the concentrations of chemical constituents in water from the aquifers would not restrict the use of the water for most purposes. High concentrations of iron do occur and require treatment. The concentrations of dissolved solids in 39 of 41 samples were 160 ppm or less. (Knapp-USGS)
W70-00465

HYDROLOGIC EFFECTS OF THE EARTHQUAKE OF MARCH 27, 1964, OUTSIDE ALASKA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W70-00467

GROUNDWATER RECONNAISSANCE IN THE BURNT RIVER VALLEY AREA, OREGON,
Geological Survey, Washington, D.C.
Don Price.
Geol Surv Water-Supply Pap 1839-I, 1967. 27 p, 7 fig, 1 plate, 3 tab, 14 ref.

Descriptors: *Water resources, *Groundwater, *Surveys, *Oregon, Water wells, Water yield, Water quality, Data collections, Hydrologic data, Hydrogeology, Water levels, Aquifers, Gravels, Basalts.
Identifiers: *Burnt River Valley (Oregon).

The Burnt River valley area in southern Baker and northern Malheur Counties, Oreg., is underlain by rocks that range in age from pre-Tertiary to Quaternary. The pre-Tertiary rocks and most of the Tertiary rocks that underlie the map area have relatively low permeability and yield water slowly to wells and springs. Potentially productive aquifers occur in the Quaternary alluvium in the Burnt River and Willow Creek valleys, in the fluviolacustrine deposits, and in basaltic lava flows that extend beneath the valley floors. Fluviolacustrine deposits yield only small to moderate quantities of water, generally less than 50 gpm, to wells, but they contain gravel lenses locally which could yield moderate to large quantities of water. Basaltic rocks that are intercalated with and extend beneath the fluviolacustrine deposits near Huntington and in Willow Creek valley yield moderate to large quantities of water (as much as 1,000 gpm) to wells; however, those rocks are of limited extent in the study area and in most places appear to lie above the regional water table. The groundwater is chemically suitable for irrigation of most crops that can be grown under the climatic conditions of the area. However, samples collected from 2 wells that tap the fluviolacustrine deposits, one near Durkee and the other near Bridgeport, were classified as having very high sodium and a high salinity hazard; those samples also contained concentrations of boron that could be toxic to some plants. (Knapp-USGS)
W70-00468

FLUID DYNAMICS OF MULTIPHASE SYSTEMS,
Illinois Univ., Urbana. Dept. of Mechanical Engineering.
S. L. Soo.
Waltham, Mass, Blaisdell Publishing Co, 1967. 524 p, 206 fig, 8 tab, 886 ref.

Descriptors: *Fluid mechanics, *Suspension, Flow, Porous media, Turbulent flow, Laminar flow, Dynamics, Dispersion, Flocculation, Closed conduit flow, Compressible flow, Flow characteristics, Hydrodynamics, Sediment transport, Suspended load, Deposition (Sediments).
Identifiers: *Multiphase flow.

Basic concepts of multiphase fluid dynamics are discussed in a textbook intended for students in advanced graduate courses and for laboratory reseachers. The primary concern of the discussion is with particulate clouds, but flow in porous media, turbulent flow, sedimentation, and suspensions are also comprehensively presented. Topics include rigid particle transport, deformable particle transport, pipe flow of a suspension, particle-cloud transport properties, basic equations of multiphase systems, gas dynamics of suspensions, hydrodynamics of suspensions, sedimentation, fluidization, packed beds, and electrodynamics. A comprehensive bibliography and review of the literature of ideas and methods in fluid mechanics is included. (Knapp-USGS)
W70-00469

AVAILABILITY OF GROUND WATER IN YORK COUNTY, NEBRASKA,
Geological Survey, Washington, D.C.
C. F. Keech, V. H. Dreeszen, and P. A. Emery.
Geol Surv Water-Supply Pap 1839-F, p F1-F17, 1967. 17 p, 3 fig, 2 plate, 1 tab, 11 ref.

Descriptors: *Water resources, *Groundwater, *Surveys, *Nebraska, Aquifers, Water yield, Water wells, Hydrogeology, Hydrologic data, Data collections, Water level fluctuations, Water quality, Water supply, Irrigation water.
Identifiers: York County (Nebr).

York County, an area of 575 sq mi, is situated on an upland plain in southeast Nebraska. Although tributaries of the Big Blue River have eroded valleys into this plain, much of the original surface is still intact and is characterized by broad shallow undrained depressions. More than 111,000 acres of cropland was irrigated in 1964 with water pumped from 1,240 wells. The upland plain is underlain to depths of 100-450 ft by unconsolidated deposits of Quaternary age. The unconsolidated Quaternary deposits mantle the eroded surface of marine strata of Cretaceous age. The lower unconsolidated rocks of Quaternary age are saturated and constitute a highly productive aquifer throughout much of the county. Replenishment to this aquifer, derived principally from precipitation, averages about 1.5 inches per year. As the quantity of ground water pumped per year greatly exceeds the average annual quantity of recharge, most of the water used for irrigation is from storage. Consequently, water levels have been trending downward. A comparison of 1964 water levels in wells with water levels measured in 1953 shows that the water table declined more than 10 ft. beneath 42 sq mi. The ground water is of the calcium bicarbonate type, and, though hard, is chemically suitable for irrigation use on most soils in the county. (Knapp-USGS)
W70-00472

HYDROLOGIC DATA FOR THE OAK RIDGE AREA, TENNESSEE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W70-00476

GROUNDWATER RESOURCES OF THE PASCAGOULA RIVER BASIN, MISSISSIPPI AND ALABAMA,
Geological Survey, Washington, D.C.
Roy Newcome, Jr.
Geol Surv Water-Supply Pap 1839-K, p K1-K36, 1967. 36 p, 12 fig, 4 tab, 17 ref.

Descriptors: *Water resources, *Groundwater, *Mississippi, *Alabama, Aquifers, Water wells, Artesian wells, Water yield, Water quality, Hydrogeology, Water supply, Water levels, Hydrologic data, Data collections.
Identifiers: Pascagoula River Basin (Miss-Ala).

Abundant groundwater resources underlie the Pascagoula River basin, Mississippi. These resources have been developed intensively only in Hattiesburg, Laurel, Meridian, and Pascagoula. The fresh-water-bearing section is 300 to 3,500 ft thick and is composed chiefly of sand and clay of Eocene to Recent age. Major rock units represented are the Wilcox, Claiborne, Jackson, and Vicksburg Groups and formations of Miocene and Pliocene ages. Aquifers in the Claiborne Group provide water for all purposes in the northern third of the basin. The Claiborne is underlain by the potentially important but virtually untapped Wilcox Group. Miocene aquifers are the main source of water supplies in the southern half of the basin, but Pliocene aquifers furnish most supplies in the Jackson County area at the basin's southern extremity. Groundwater levels are within 50 ft of the surface in most places, and flowing wells are common in the valleys and near the coast. Water-level declines due to pumping have become serious problems only in a few localities of heavy withdrawal. Although few wells in the basin yield more than 500 gpm, yields of 1,000 gpm or more could be reasonably expected from efficiently constructed wells almost anywhere in the region. The groundwater is of good to excellent quality. Saltwater encroachment is a potential problem in the coastal area, but little increase in salinity has been observed in monitor wells in the period 1960-65.

Saline-water resources are available for development at considerable depth in most of the region. (Knapp-USGS)
W70-00477

AN INEXPENSIVE METHOD FOR DETERMINING THE DIRECTION OF NATURAL FLOW OF GROUNDWATER,
Irrigation Research Inst., Lahore (Pakistan).
Mohammad Saleem.
J Hydrol, Vol 9, No 1, p 73-89, Sept 1969. 17 p, 5 fig, 10 ref, append.

Descriptors: *Groundwater movement, *Tracers, Tracking techniques, Monitoring, Water wells, Instrumentation, Mathematical studies, Drainage, Percolation.
Identifiers: Groundwater tracers.

Groundwater flow is a vector quantity, the magnitude of which can be easily determined in situ by measuring the rate of dilution of a tracer in a borehole with perforated screen, called the 'Master-well'. Knowing the magnitude, the direction then can easily be evaluated by introducing another vector quantity of known magnitude and direction and then finally measuring the magnitude of the resultant flow. This new vector can be introduced by pumping a tube-well at some convenient distance from the master-well. All flow measurements are carried out in the same master-well. If the tracer used is not radioactive, the dilution rates are computed by measuring the electrical conductivities using low voltage and low frequency A.C. (Knapp-USGS)
W70-00635

PORE STUDIES OF HIGHLY INDURATED APPALACHIAN ROCKS,
Virginia Univ., Charlottesville. Dept. of Geology; Virginia Highway Research Council, Charlottesville; and Cities Service Oil Co., Tulsa, Okla.
W. Cullen Sherwood, and Jinn Huie Huang.
The Amer Ass Petrol Geol Bull, Vol 53, No 10, Part 1, p 2161-2170, Oct 1969. 10 p, 12 fig, 2 tab, 22 ref.

Descriptors: *Porosity, *Carbonate rocks, *Metamorphic rocks, *Appalachian Mountain Region, Fractures (Geology), Permeability, Pores, Rock properties, Void ratio, Voids, Groundwater movement.
Identifiers: Pore geometry, Porosimetry.

The porosity and pore-size distribution of highly indurated carbonate rocks and igneous and metamorphic silicate rocks from the Valley and Ridge and Piedmont provinces in Virginia were studied by mercury-porosimetry, specific-gravity, and petrographic techniques. Porosity values range from 0.19 to 3.66%, and mean pore diameters from 0.010 to 0.866 microns. Fundamental differences in the character of pores were noted between the igneous and metamorphic rocks and the carbonate rocks. Pores in the individual crystalline rocks are concentrated predominantly at 2 to 4 different sizes, whereas those in the carbonate rocks generally are of one size. Also the mean pore diameters in the carbonate rocks are generally smaller; the pores are of a lesser size range than those in the igneous and metamorphic rocks, but the porosity of the carbonate rocks generally is higher and shows a greater variation. The low porosity and small pores measured in the dolomitic rocks from Virginia appear to indicate that most dolomitization preceded the strong compactive forces of Appalachian folding. (Knapp-USGS)
W70-00659

DETERMINATION OF DEPENDENCE BETWEEN FILTRATION CHARACTERISTICS OF DRAINAGE CANALS (IN RUSSIAN),
Akademiya Nauk Gruzinskoi SSR, Tiflis.
For primary bibliographic entry see Field 04A.
W70-00663

A LIMNOLOGICAL STUDY OF A TENNESSEE COLD SPRINGBROOK,
Tennessee Rechnological Univ., Cookeville. Dept. of Biology.
For primary bibliographic entry see Field 02I.
W70-00672

WATER BUDGET STUDIES IN KARST AQUIFERS,
McMaster Univ., Hamilton (Ontario). Dept. of Geography; and Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
M. C. Brown, T. L. Wigley, and D. C. Ford.
J Hydrol, Vol 9, No 1, p 113-116, Sept 1969. 4 p, 2 fig, 16 ref.

Descriptors: *Tracers, *Karst, *Aquifers, *Limestones, Groundwater movement, Dye releases, Tracking techniques, Springs, Streamflow, Sinks, Subsurface drainage, Instrumentation, Hydrologic budget.
Identifiers: Stream gaging, Springflow gaging.

The use of tracers in limestone hydrology studies is discussed and an example of the use of Rhodamine-WT in a study of a karst aquifer in British Columbia is given. Rhodamine WT is not easily adsorbed by clays and other minerals, and few substances interfere at its emission wavelength. In the field test, 1320 cc of dye was injected into a stream above a sink. Streamflow was calculated from dilution measurements above the sink and below a spring. The dye recovery at the spring was 98%, proving that the sink and spring are directly connected. The same technique can be used in more complex cases. (Knapp-USGS)
W70-00676

GROUNDWATER RESOURCES OF THE ERIE-NIAGARA BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
A. M. LaSala, Jr.
NY State Water Resources Comm Basin Planning Rep ENB-3, 1968. 114 p, 20 fig, 5 plate, 9 tab, 29 ref.

Descriptors: *Water resources, *Groundwater, *Surveys, *New York, Lake Erie, Hydrologic data, Data collections, Water wells, Aquifers, Water levels, Water quality, Water pollution, Groundwater movement, Induced infiltration, Water supply, Duration curves, Hydrographs.
Identifiers: Erie-Niagara Basin (NY).

The Erie-Niagara basin, New York, borders Lake Erie and the Niagara River and includes the principal part of their drainage basin in New York. The principal water-bearing formations in the area are glacial sand and gravel deposits; the Camillus Shale, which contains interbedded gypsum; a limestone aquifer unit consisting of the Onondaga Limestone, Akron Dolomite, and Bertie Limestone; and the Lockport Dolomite. A number of thick and permeable sand and gravel deposits lie in the valleys of the upland region and will yield supplies of 500 to 1,400 gpm to individual wells that are properly constructed. Average annual recharge to the sand and gravel deposits in the upland region ranges from about half a million to 4 mgd/sq mi. As the larger deposits are each several square miles in extent, the potential for development is large. To this potential should be added infiltration from streams that could be induced by pumping large quantities of groundwater. The quality of groundwater in the Appalachian Uplands is marked by a high hardness but generally not by other unfavorable characteristics. Shallow groundwater in carbonate rocks and sand and gravel deposits locally has been polluted by septic tank effluent. (Knapp-USGS)
W70-00687

2G. Water in Soils

FORCES ACTING UPON THE SOLID PHASE OF A POROUS MEDIUM,
Agricultural Research Service, Madison, Wis.
Petrus A. C. Raats.
J Appl Math and Phys, Vol 19, No 4, p 606-613, July 1968. 8 p, 10 ref.

Descriptors: *Porous media, *Flow, *Stress analysis, *Mathematical studies, Groundwater movement, Soil water movement, Darcy's law, Soil physical properties, Soil physics, Hydraulics.
Identifiers: Continuum theory of mixtures.

The forces acting on the solids phase of porous media in which fluid is flowing are analyzed mathematically using the continuum theory of mixtures. Porous media consisting of a solid phase and any number of fluid phases are considered. Some special cases discussed are Darcy's law, seepage force, and effective stress. (Knapp-USGS)
W70-00459

TRACTIONABILITY STUDY FOR THE LAOTIAN PANHANDLE,
Environmental Technical Applications Center (Air Force), Washington, D.C.
Thomas E. White.
USAF, Air Weather Service, ETAC Technical Note 69-5, July 1969. 46 p, 13 tab, 15 fig, 2 ref. Available from the Clearinghouse as USAF ETAC Tech Note 69-5, $3.00 in paper copy, $0.65 in microfiche. AD-691 006.

Descriptors: *Soil moisture.
Identifiers: *Tractionability, Laos.

This study provides percent frequency of various tractionability classes (Thornthwaite's method) for 12 stations in the Laotian Panhandle and one in S. Vietnam. The stations are along major road networks in the Laotian Panhandle. Data are presented in tabular and graphical form.
W70-00484

EARTHFLOW OCCURRENCE DURING HIGH INTENSITY RAINFALL IN EASTERN OTAGO (NEW ZEALAND),
Otago Univ., Dunedin (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 02B.
W70-00647

ERODIBILITY OF SAND-CLAY MIXTURES AS EVALUATED BY A WATER JET,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 02J.
W70-00724

PHYSICAL PROPERTIES OF PEATS AS RELATED TO DEGREE OF DECOMPOSITION,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
D. H. Boelter.
Soil Sci Soc Amer Proc 33 (4) July-Aug 1969, p 606-609.

Descriptors: *Peat, *Organic soils, *Soil density, *Soil water, *Hydraulic conductivity, Bogs, Minnesota, Soil physical property, Soil moisture, Soil water movement, Hydrologic properties, Saturated flow, Retention, Porosity.
Identifiers: *Fiber content, Degree of decomposition, *Histosols, Sapric peat, Hemic peat, Fibric peat.

Important physical characteristics, such as water retention, water yield coefficient, and hydraulic conductivity, vary greatly for representative northern Minnesota peat materials. The differences are related to the degree of decomposition, which largely determines the porosity and pore size distribution. Fiber content (>0.1 mm) and bulk density are properties often measured to indicate the degree of decomposition of peat materials and are criteria used to distinguish fibric, hemic and sapric peat types. Regression analyses showed a curvilinear relationship of water contents at saturation, 5 mbar, 0.1 bar, and 15 bar suctions, to fiber content (>0.1 mm) and bulk density with coefficients of multiple determination (R sq) ranging

from .66 to .88. Regression analyses of the logarithm of hydraulic conductivity on fiber content (>0.1 mm) and bulk density indicate a linear relationship (r sq= .54), although not as great due to the variability of hydraulic conductivity. Thus the classification of peat materials and organic soils based primarily on degreee of decomposition as measured by fiber content and vulk density would relate significant information about their physical characteristics.
W70-00761

2H. Lakes

AN ORIENTATION STUDY OF THE URANIUM DISTRIBUTION IN LAKE WATERS, BEAVERLODGE DISTRICT, SASKATCHEWAN,
Eldorado Mining and Refining Ltd., Montreal (Quebec).
John A. MacDonald.
Quart Colo School of Mines, Int Geochem Explor Symp, Vol 64, No 1, p 357-376, Jan 1969. 20 p, 9 fig, 2 tab, 15 ref.

Descriptors: *Uranium radioisotopes, *Lakes, *Surface waters, Chemical analysis, Bicarbonates, Conductivity, Seasonal, Spring, Temperature, Solubility, Geology, Topography, Mapping, Analytical techniques, Drainage, Statistical methods.
Identifiers: *Canada, *Saskatchewan, Geochemical prospecting.

Surface waters of the Beaverlodge uranium district of Saskatchewan were investigated for their mineral content. With the exception of the spring breakup period, there is no significant variation in the uranium content of lake water which can be attributed to seasonal temperature changes or precipitation. Correlation studies show an increase in specific conductance of lake water in the vicinity of mineralized areas. Lake water assays, in general, show that the Beaverlodge uranium district is delineated by an analytical plateau of 0.9 ppb U, approximately twice the regional background value of 0.4 ppb. Numerous high concentrations occurring within the background plateau levels define zones of pitchblende mineralization. (Gabriel-USGS)
W70-00423

URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
British Newfoundland Exploration Ltd.
W. T. Meyer.
Quart Colo School of Mines, Int Geochem Explor Symp, Vol 64, No 1, p 377-394, Jan 1969. 18 p, 13 fig, 3 ref.

Descriptors: *Lakes, *Water chemistry, *Uranium radioisotopes, *Trace elements, *Arctic, Exploration, Mapping, Glaciation, Ice, Statistical methods, Geophysics, Gamma rays, Streamflow, Sampling, Organic matter, Temperature, Carbonates.
Identifiers: *Canada, Labrador, *Geochemical prospecting.

The shallow lakes of glacial origin located in the Kaipokok region of Labrador were investigated for their uranium content by using a gamma-ray spectrometer flown by fixed-wing and helicopter systems and the U.S. Geological Survey technique based on the evaporation of 10-milliliter samples of lake waters. Lake water surveys for uranium are a significant aid to airborne exploration in this region of Labrador. Ideally, sampling should take place in the late fall and attention should be given to the effect of the biochemical cycle of uranium and especially to the contribution of uranium by swamp erosion. Because of the low cost of lake water surveys, this method could be used as a preliminary step before selecting areas to be flown using more expensive geophysical surveys. (Gabriel-USGS)
W70-00424

WATER-RELATED RESEARCH FOR THE GREAT LAKES REGION,
Michigan Univ., Ann Arbor. Dept. of Conservation; and Michigan Univ., Ann Arbor. Inst. of Science and Technology.
Spenser W. Havlick, and James T. Wilson.
EOS, Trans Amer Geophys Union, Vol 50, No 8, p 492-494, Aug 1969. 3 p.

Descriptors: *Research and development, *Water management (Applied), *Great Lakes, *Water resources development, Water quality, Systems analysis, Model studies, Economics, Data collections, Data storage and retrieval, Regional analysis, Data processing.
Identifiers: *Great Lakes region.

Coordinated study of water resources management in the Great Lakes by using systems analysis is recommended. The Great Lakes Basin Commission is suggested as a possible coordinating mechanism for water resources research between universities, research oriented organizations, and Federal and State agencies. A regional comprehensive model for the Great Lakes is not feasible at this time. Development of subsystem models is recommended for each geographic area of the Great Lakes region. The main areas of proposed research are: (1) water quantity and lake level models; (2) water quality models; and (3) economic growth models. There is also need for coordination of information retrieval, data storage, and data collection. An appraisal of the water management decisions is also recommended. (Carstea-USGS)
W70-00433

ECOLOGICAL FACTORS AND THE DISTRIBUTION OF CLADOPHORA GLOMERATA IN THE GREAT LAKES,
Wisconsin Univ., Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W70-00667

COMPARATIVE ECOLOGY OF SANDSPIT PONDS,
Oberlin Coll., Ohio. Dept. of Biology.
For primary bibliographic entry see Field 02L.
W70-00671

OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
Nevada Fish and Game Dept., Reno; and California State Dept. of Fish and Game, Sacramento. Inland Fisheries Branch.
Ted C. Frantz, and Almo J. Cordone.
Ecology, Vol 48, No 5, p 709-714, 1967. 3 fig, 3 tab, 17 ref.

Descriptors: *Deep water, *Lakes, *Plants, *California, *Nevada, Depth, Algae, Mosses, Chara, Fish, Limnology, Lake trout, Crayfish, Stoneflies, Snails, Ecology, Eutrophication, Domestic wastes, Shallow water, Chlorophyta, Chrysophyta, Cyanophyta, Sampling, Density, Light, Mud, Silts, Sands, Gravels, Sediments, Water pollution sources.
Identifiers: *Lake Tahoe (Calif-Nev), Hydrophytes, Liverworts, Morphometry, Pacifastacus leniusculus, Anacharis canadensis, Myriophyllum, Potamogeton crispus, Microspora wittrockii, Spirogyra, Xanthophyceae, Myxophyceae, Salvelinus namaycush, Substrate type.

Aquatic studies of Lake Tahoe have disclosed a remarkable plant zonation. With surface area not unusually large, it has maximum depth of 1645 feet, mean depth of 1027 feet. Deepwater macroscopic hydrophytes in Lake Tahoe, found to depths of 500 feet, consisted of algae, mosses, and liverworts. Most were concentrated at depths of 200-350 feet. Only Chara occasionally invades areas shallow as 20 feet; other deepwater hydrophytes are restricted to depths below 50 feet. The list of identified species, probably incomplete, includes six algae, ten mosses, and two liverworts. Although light transmission probably controls maximum depth of plant occurrence, factors limiting inshore distribution are less clear. Substrate type at lake's south end seems to control shoreward extension of plants. These deepwater plant beds are not only unusual scientific interest but appear important in the life history of Tahoe's major game fish, the lake trout, whose maximum concentration coincides with these plant zones; plants apparently provide shelter for crayfish, nongame fishes, and small lake trout. Longterm research on ecology of these deepwater hydrophyte communities is needed. Lake Tahoe is threatened with eutrophication from domestic wastes. (Jones-Wisconsin)
W70-00711

VERTICAL DISTRIBUTION OF PHOSPHORUS IN LINSLEY POND MUD,
Duke Univ., Durham N.C. Dept. of Zoology.
D. A. Livingstone, and J. C. Boykin.
Limnology and Oceanography, Vol 7, p 57-62, Jan 1962. 4 fig, 20 ref.

Descriptors: *Phosphorus, *Sorption, *Lake soils, Cycling nutrients, Bacteria, Lakes, Sediments, Ion exchange, Iron compounds.
Identifiers: *Linsley Pond (Conn), *Sediments (Mineral fraction), Seston, Einsele sorption isotherm, Diagenetic changes, Gyttja, Aluminum compounds, Hydroxyphosphates, Specific conductance.

Nitric-perchloric acid digestion disclosed large quantities of phosphorus (P) in the basal third of the sediment consisting largely of mineral particles. The low solubility of sedimentary phosphates, as shown by water and hydrochloric acid (0.1 Normal) extractions, suggested existence of sorption reactions of the element with the mineral fraction of the lake mud. Under conditions in lake soils, fixation of P in the form of apatite or iron and aluminum hydroxyphosphates is not feasible and the causes for the conversion of P into slowly soluble form was not disclosed. The ratio of bound P to inorganic material of different texture suggested a possibility of sorption on the surface of mineral particles. Regardless of the nature of reactions, the productivity of the lake is inversely proportional to the fixation capacity of the sediment and directly proportional to the total ionic activity of the water. (Wilde-Wisconsin)
W70-00712

COMPUTATION OF THE COMPONENTS OF THE THERMAL BALANCE OF PLANNED RESERVOIRS,
For primary bibliographic entry see Field 02D.
W70-00744

2I. Water in Plants

A LIMNOLOGICAL STUDY OF A TENNESSEE COLD SPRINGBROOK,
Tennessee Rechnological Univ., Cookeville. Dept. of Biology.
Michele S. Stern, and Daniel H. Stern.
The Amer Midland Natur, Vol 82, No 1, p 62-82, July 1969. 21 p, 3 fig, 4 tab, 52 ref.

Descriptors: *Limnology, *Springs, *Tennessee, Invertebrates, Seasonal, Forests, Animal population, Algae, Insects, Analytical techniques, Chemical analysis, Rainfall, Geology, Currents (Water), Calcium, Carbon, Nitrogen, Silica, Water temperature, Biota.
Identifiers: Springbrook limnology, Putnam County (Tenn).

A one-year limnological investigation was conducted on a small springbrook in Putman County, Tennessee to evaluate the components of invertebrate biocoenoses, to record the population fluxes and factors affecting abundance, and to determine interaction between members of the communities. Study of 59 taxa of invertebrates shows their greatest abundance in February and lowest in July. It is assumed that the surrounding

deciduous forest has the greatest effect on species composition and abundance of the fauna of the springbrook. (Gabriel-USGS)
W70-00672

THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
Wisconsin State Univ., Superior.
Donald W. Davidson.
Paper presented before Minnesota Academy of Science, University of Minnesota, Duluth, May 3, 1969. OWRR Project A-023-WIS.

Descriptors: *Ecology, *Forest, *Vegetation, *Trees, Conservation.
Identifiers: *Northern Wisconsin, *Brule River basin, *Saplings.

Under contract with the Water Resources Center, University of Wisconsin, Madison, and as part of an interdisciplinary study of the ecology of the Brule River Basin, northern Wisconsin, during the summer of 1968 a survey was made of 20 stands of relatively undisturbed forest vegetation, distributed uniformly over the Brule River Basin. In each stand, 20 points were sampled by the Point-centered Quarter Method. Stems 3.96 inches diameter at breast height and over were classed as trees - those less than 3.95 inches d.b.h. were classed as saplings. Seventeen upland stands were sampled, and were dominated by the following leading dominant tree species: Quercus rubra, 5 stands; Populus tremuloides, 4; Populus grandidentata, 2; Pinus banksiana, 2; Abies balsamea, 2; Acer rubrum, 1; and Acer saccharum, 1. Three lowland stands were sampled, and were dominated by: Picea mariana, 1; Thuja occidentalis, 1; and Fraxinus nigra, 1. Curtis (1959 - The Vegetation of Wisconsin) describes three principal vegetation types for the area; (1) Northern forest - xeric; (2) Northern forest - lowland; (3) Boreal forest. These three types have distinct representatives in the stands studied thus far. The remaining stands are various successional stages of the other forest communities described. The vegetation of the Brule Basin has been much disturbed, particularly by cutting for lumber and pulp, so that most of the present vegetation can be said to be recovering from previous disturbance. (Dickas-Wisconsin State Univ)
W70-00765

2J. Erosion and Sedimentation

THE USE OF RADON-222 IN SURFACE WATERS IN GEOCHEMICAL PROSPECTING FOR URANIUM,
Geological Survey of Canada, Ottawa (Ontario).
Willy Dyck, and A. Y. Smith.
Quart Colo School of Mines, Int Geochem Explor Symp, Vol 64, No 1, p 223-236, Jan 1969. 14 p, 6 fig, 20 ref.

Descriptors: *Radioactivity techniques, *Uranium radioisotopes, Geochemistry, *Exploration, Sampling, Mine waters, Water chemistry, Surface waters, Ice, Lakes, Streams, Geology, Mapping, Statistical methods, Temperature.
Identifiers: *Canada, *Geochemical prospecting, Uranium.

As part of a geochemical prospecting study of uranium, a feasibility test of the use of radon-222 in surface waters was carried out during the latter part of 1967. The radon-222 and uranium contents of some 150 water samples from 140 sample sites in the Bancroft, Ontario, and Ottawa-Hull districts were found to vary from 0 to 2,200 pc/l and 0 to 47 ppb, respectively. A difference was observed between the radon content of lakes and ponds (0 to 262 pc/l, with some of the higher values being near uranium mining operations) and that of creeks and streams (0 to 2,200 pc/l). No such variations was noted for uranium. Although the correlation between radon and uranium values in the waters was marginal, the results indicated a gross areal correlation between radon or uranium content of surface waters and uraniferous areas. Spot measurements in winter found that radon levels in lake waters under the ice increase as expected but remain more or less constant in creeks. Uranium levels, on the other hand, remain more or less constant in lakes but decrease noticeably in creeks. The low cost and simplicity of the radon method suggest considerable potential as a preliminary reconnaissance geochemical prospecting method. (Gabriel-USGS)
W70-00421

INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
Amax Exploration, Inc., Vancouver (British Columbia); and Imperial Coll. of Science and Technology, London (England). Dept. of Geology.
R. F. Horsnail, I. Nichol, and J. S. Webb.
Quart Colo School of Mines, Int Geochem Explor Symp, Vol 64, No 1, p 307-322, Jan 1969. 16 p, 9 fig, 1 tab, 12 ref.

Descriptors: *Geochemistry, *Drainage, *Metals, *Surface waters, Environmental effects, Chemical analysis, Spectroscopy, Trace elements, Iron, Copper, Manganese, Lead radioisotopes, Zinc radioisotopes, Geology, Glacial soils, Rainfall, Soils.
Identifiers: *England and Wales, *Geochemical prospecting.

Drainage sediment sampling of about 3000 sq mi located in England and Wales was carried out for the purpose of determining the contents of Ag, Bi, Co, Cr, Cu, Fe, Ga, Mn, Mo, Ni, Pb, Sn, Ti, and V, to be used in regional geochemical reconnaissance for useful minerals. The distribution of these metals in the samples is closely related to secondary environment, in particular to areas of high rainfall and poorly drained soils, and less related to either geology or mineralization. Such correlations are shown, to various degrees, by Mn, Fe, Co, As, Ni, and Zn. In contrast, Cr, Ga, Ti, and V show no variation with respect to surface environment. The enhancement of certain elements in the drainage sediments is caused by hydromorphic dispersion controlled by variations in the Eh and pH of the aqueous media of dispersion. (Gabriel-USGS)
W70-00422

NATURAL ORGANIC ACIDS IN THE TRANSPORTATION, DEPOSITION, AND CONCENTRATION OF GOLD,
Colorado School of Mines, Golden; and Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02K.
W70-00425

ON THE GEOCHEMISTRY OF UPPER PALEOZOIC AND LOWER MESOZOIC SEDIMENTS OF THE NORTHERN PART OF THE CISVERKHOYANSK TROUGH (RUSSIAN),
Akademiya Nauk SSSR. Institut Geologii.
For primary bibliographic entry see Field 02K.
W70-00429

DIRECT ILLUSTRATION OF ONE WAY SAND TRANSPORT BY TIDAL CURRENTS,
National Inst. of Oceanography, Wormley (England).
Robert H. Belderson, and Neil H. Kenyon.
J Sediment Petrol, Vol 39, No 3, p 1249-1250, Sept 1969. 2 p, 2 fig, 1 ref.

Descriptors: *Sediment transport, *Sand waves, *Remote sensing, *Underwater, Beaches, Beach erosion, Sands, Waves (Water), Currents (Water), Bed load, Tides.
Identifiers: Side-scan sonar.

Side scan Asdic (sonar) has revealed local sand streams originating from the wings of sand waves and from between rock barriers. These provide further proof of the direction of net sand transport by tidal currents in the Bristol Channel, England. (Knapp-USGS)
W70-00436

QUANTITATIVE STATISTICAL ANALYSES OF COLUMBIA RIVER SEDIMENT SAMPLES,
Washington Univ., Seattle. Dept. of Oceanography.
James C. Kelley, and John T. Whetten.
J Sediment Petrol, Vol 39, No 3, p 1167-1173, Sept 1969. 7 p, 5 fig, 14 ref. Contract No AT (45-1) - 1725 AEC, Grant No GP-3591 and GA-1297 NSF.

Descriptors: *Sedimentation, *Sedimentology, *Statistical methods, *Correlation analysis, Sediments, Columbia River, Chemical analysis, Mineralogy, Particle size, Trace elements, Clays, Reservoirs.
Identifiers: Columbia River sediments, Multivariate statistical analysis.

Sediment samples from the Columbia River were analyzed for four variable sets: bulk chemistry, trace element chemistry, bulk mineralogy, and heavy mineral content. The variable sets were analyzed by discriminant function analysis and factor analysis to determine the relationships between samples in Columbia River reservoirs as reflected in their distribution in the variable space. Other statistical studies were made to determine the relationships among the variables and changes in the variables related to position in the river and grain size. The distribution of the samples in the variable space indicates changes in the sediment which can be related to changing source areas. (Knapp-USGS)
W70-00438

DEPOSITION OF CLASTIC SEDIMENTS BY CLAMS,
Bureau of Reclamation, Sacramento, Calif.
Nikola P. Prokopovich.
J Sediment Petrol, Vol 39, No 3, p 891-901, Sept 1969. 11 p, 11 fig, 2 tab, 10 ref.

Descriptors: *Deposition (Sediments), *Clams, *Filtration, Suspended load, Sedimentation rates, Sedimentation, Turbidity.
Identifiers: Biological deposition (Sediments).

The role of clams and other 'filter feeders' in sedimentation probably far exceeds the generally recognized accumulation of their skeletal remnants. In the course of their feeding, these organisms constantly remove suspended inorganic and organic particles from water, combine them with organic binder, and deposit them as excreta. The 'sticky' excreta (and shells) trap sand and other particles and contribute to sedimentation. The amount of clastic sediments deposited in this manner is significant, for example, in the 113-mile-long Delta-Mendota Canal in the western San Joaquin Valley, California. The sediments consist of 20-35% 'fines' which were probably precipitated as excreta, 35-50% sand, and 30% clamshells. Highly eutrophic, turbid deltaic water which is pumped into the canal supports an abundant, varied biota.Asiatic clams (Corbicula fluminea) are particularly numerous. The average number of live clams per sq ft of sediments is in the order of 1000. Laboratory pumping rate of a one-year Corbicula appears to be about 20 cc/hour. There is a general decline of clam infestation in the downstream direction, away from the Delta: In 1965-66, biomasses of Corbicula declined from about 140 (pool 1) to 25 (pool 18) tons per linear mile. Average sedimentation rates decline from about 292 cu yd/mi/yr in pools 1 through 5, to 9 cu yd/mi/yr in pools 15 through 19. Apparently smaller pumping-deposition of suspended particles by clams in downstream reaches results in correspondingly lower sedimentation rates. (Knapp-USGS)
W70-00442

ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
Shell Development Co., Houston, Tex. Exploration and Production Research Div.; and Johns Hopkins Univ., Baltimore, Md. Dept. of Geology.
Eugene A. Shinn, R. Michael Lloyd, and R. N. Ginsburg.
J Sediment Petrol, Vol 39, No 3, p 1202-1228, Sept 1969. 27 p, 37 fig, 1 tab, 25 ref.

Descriptors: *Mud flats, *Tidal marshes, *Sedimentology, *Diagenesis, *Water chemistry, Geomorphology, Oxidation, Reduction (Chemical), Carbonate rocks, Limestones, Dolomite, Sedimentation, Chemical reactions, Chemical precipitation.
Identifiers: *Andros Island (Bahamas), Tidal flat.

The carbonate tidal-flat complex of northwestern Andros Island consists of 3 geomorphic areas: (1) adjacent marine belt, (2) channeled belt, and (3) marsh. The various sedimentary accumulations within these belts are controlled by tide levels. Three tidal zones are recognized: (1) subtidal zone, consisting of sediments deposited below low tide; (2) intertidal zone, consisting of sediments deposited between normal low and normal high tide; and (3) supratidal zone, consisting of sediments deposited above normal high tide but within the range of spring and storm tides. The complex may be thought of as a river delta turned 'inside out.' Most sediments that make up this delta have been transported via channel systems from the adjacent marine zone. Early diagenesis in the form of reduction, oxidation, dolomite formation, and carbonate cementation is also controlled by tide level. Strong odor of hydrogen sulfide in gray subtidal sediments suggests reduction, whereas the absence of this odor in the cream or light tan intertidal and supratidal sediments suggests oxidation. Dolomite formation and carbonate cementation are restricted to the distinctively laminated, algal-coated, and mud-cracked supratidal sediment. Stratigraphically, the channeled tidal-flat complex on northwest Andros Island is transgressive, whereas the nonchanneled flats on the southwestern coast are thought to be regressive. Alternation of transgressive and regressive tidal-flat sedimentation during subsidence or eustatic sea level rise could produce stratigraphic pinch-outs that may also become stratigraphic traps. (Knapp-USGS)
W70-00445

CHARACTERISTICS OF COLUMBIA RIVER SEDIMENT AND SEDIMENT TRANSPORT,
Washington Univ., Seattle. Dept. of Geology; and Washington Univ., Seattle. Dept. of Oceanology.
John T. Whetten, James C. Kelley, and Larry G. Hanson.
J Sediment Petrol, Vol 39, No 3, p 1149-1166, Sept 1969. 18 p, 10 fig, 5 tab, 34 ref. Contract No AT (45-1)-1725 AEC, Grant No GP-3591 and GA-1297 NSF.

Descriptors: *Sediments, *Columbia River, *Provenance, Suspended load, Bed load, Sediment yield, Sediment transport, Mineralogy, Erosion, Weathering, Particle size, Runoff, Scour, Reservoirs, Silting, Sand waves.
Identifiers: Columbia River sediments.

The mean particle size of sediment carried on the bed of the Columbia River increases downstream. The Snake River and other upstream tributaries contribute mostly fine sediment carried in suspension. Many downstream tributaries produce coarser sediment, which is carried largely in the bedload. Bedload is appreciable only in the lower portions of the river, and is a small percentage of the suspended load. Large migrating sand waves form the top surface of the bed. The distribution of sediment on some of the reservoir floors changes throughout the year. Sediment deposited during low discharges may be scoured from the reservoirs during periods of high discharge and transported downstream through the dams. The amount of sediment transported during a single flood may exceed that which is transported during an entire 'average' year. The mineral and chemical composition of Columbia River sediment obtained from reservoir floors suggests that the sediment particles have undergone relatively little chemical weathering. Chemically unstable mineral grains and lithic fragments abound. Quartz and elements considered relatively immobile during chemical weathering show no obvious enrichment in the sediment. The ratio of quartz to all 'unstable' constituents decreases downstream, whether the latter are taken individually or as a group. The upstream fine suspended sediment is derived ultimately from metamorphic, plutonic, and sedimentary rocks, and downstream bed load sediment is derived largely from the erosion of andesitic volcanic rocks and sediments. It is likely that these two sediment types remain more or less physically separated during transport and deposition. (Knapp-USGS)
W70-00446

GEOMORPHOLOGY OF A SAND RIDGE,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
J. Duncan Smith.
J Geol, Vol 77, No 1, p 39-55, Jan 1969. 17 p, 8 fig, 2 tab, 31 ref.

Descriptors: *Geomorphology, *Sand bars, *Currents (Water), Tides, Oceans, Islands, Dunes, Sand waves, Deposition (Sediments), Sedimentation, Erosion, Sedimentary structures.
Identifiers: Marthas Vineyard (Mass).

In the past, sand ridges and the associated marine sand waves have been studied extensively from a morphological point of view, but several important historical and dynamical problems associated with these features have been neglected. The present dynamical setting of a sand ridge (a shoal named Middle Ground) in Vineyard Sound, Massachusetts, is outlined and its origin is discussed. Sand waves cover the ridge. Those with amplitudes of 2 m are found to be completely rebuilt in half a tidal cycle, and those with amplitudes of 6 m are found to be significantly rebuilt over half a tidal cycle. Net movements of the sand waves are consistent with the counterclockwise net circulation of water around the ridge. Over the sand-wave crests the average maximum shear velocity is 4.5 cm/sec. Middle Ground is a body of sand, but its southwest extension (Lucas Shoal) is composed of glacial drift and veneered with sand. The geomorphological history of Middle Ground is traced from the deposition of a small Wisconsin recessional moraine, through a period of sea level rise during which wave erosion and longshore drift created an elongate submarine sand ridge, to a period of submergence during which waves modified the relic morainal feature and tidal currents reshaped both the submerged sand ridge and the relic moraine. The present morphology of the shoal is in dynamic equilibrium with the tidal current system, and large-scale morphological changes occur within a period of only a few years. (Knapp-USGS)
W70-00453

A RECONNAISSANCE OF STREAM SEDIMENT IN THE ERIE-NIAGARA BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
R. J. Archer, and A. M. La Sala, Jr.
N Y State Water Resources Comm Basin Planning Rep ENB-5, 1968. 34 p, 7 fig, 4 tab, 9 ref.

Descriptors: *Sediment load, *New York, Suspended load, Bed load, Sediment yield, Streamflow, Erosion, Deposition (Sediments), Sedimentation, Lake Erie, Surveys, Sampling.
Identifiers: *Erie-Niagara Basin (NY).

A reconnaissance study of erosion and deposition of sediment in the Erie-Niagara basin indicates that the highest sediment yields, on the order of 1,000 tons/sq mi/yr, occur in streams that drain upland areas. In contrast, for example, from the lowland part of the Tonawanda Creek basin, the annual sediment yields are on the order of 100 tons/sq mi/yr. The estimated average annual sediment yields of streams in the basin range from 50 tons/sq mi for Little Tonawanda Creek at Linden, to 1,500 tons/sq mi for Cazenovia Creek at Ebenezer. These estimates are based on measured instantaneous sediment discharge at selected stream stations, the sediment loads of which ranged from 1,100 tons/yr for Little Tonawanda Creek at Linden to 610,000 tons/yr for Cattaraugus Creek at Gowanda. Peak suspended-sediment concentrations in the range of 2,600 to 5,300 ppm were observed at 3 stations in the Cattaraugus Creek basin, as well as at Buffalo Creek at Gardenville, Cazenovia Creek at Ebenezer, and Cayuga Creek near Lancaster. (Knapp-USGS)
W70-00466

GRAIN SIZE DISTRIBUTIONS AND DEPOSITIONAL PROCESSES,
Tulsa Univ., Okla.
Glenn S. Visher.
J Sediment Petrol, Vol 39, No 3, p 1074-1106, Sept 1969. 33 p, 21 fig, 1 tab, 52 ref. Grant No GA-997 and GA-1635 NSF.

Descriptors: *Deposition (Sediments), *Particle size, *Sands, Sedimentation, Statistical methods, Sedimentary petrology, Settling velocity, Sedimentation rates, Sediment transport, Sediment distribution, Sediments, Waves (Water), Suspended load, Bed load, Dunes, Winds.
Identifiers: Sedimentary textures, Sedimentary environment, Sedimentation dynamics.

Extensive textural study of both modern and ancient sands has provided the basis for a genetic interpretation of sand texture. Analysis is based on recognizing sub-populations within individual log-normal grain size distributions. Each long-normal sub-population may be related to a different mode of sediment transport and deposition, thus providing a measure of their importance in the genesis of a sand unit. The 3 modes of transport reflected are: (1) suspension; (2) saltation; and (3) surface creep or rolling. Each of these is developed as a separate sub-population within a grain size distribution. The number, amount, size-range, mixing, and sorting of these populations vary systematically in relation to provenance, sedimentary process, and sedimentary dynamics. The analysis of these parameters is the basis for determining the process-response characteristics of individual sand units. A number of processes are uniquely reflected in log-probability curves of grain size distribution of sands and sandstones. These include: (1) current; (2) swash and backwash; (3) wave; (4) tidal channel; (5) fallout from suspension; (6) turbidity current; and (7) aeolian dune. The combination of 2 or more of these processes also produce characteristics log-probability plots of ancient sands are directly comparable to those from modern sands. The principal limitation of this study is in comparing sands formed under comparable conditions and obtaining an independent determination of the processes of formation of ancient sands. (Knapp-USGS)
W70-00639

TIDAL FLAT EROSION BY ICE AT LA POCATIERE, ST. LAWRENCE ESTUARY,
Department of Fisheries and Forestry, Sillery (Quebec).
For primary bibliographic entry see Field 02L.
W70-00640

STRATIGRAPHY AND SEDIMENTOLOGY OF THE TERTIARY ROCKS OF THE MANDAMUS-DOVE RIVER AREA, NORTH CANTERBURY, NEW ZEALAND,
Pennsylvania Geological Survey, Harrisburg.
W. D. Sevon.
New Zeal J Geol and Geophys, Vol 12, No 1, p 283-309, May 1969. 27 p, 12 fig, 3 tab, 19 ref.

Descriptors: *Stratigraphy, *Sedimentology, *Sedimentary rocks, Tertiary period, Geology, Conglomerate rocks, Coals, Sands, Currents

(Water), Marine geology, Algae, Biomass, Volcanoes, River basins, Subsidence, Mapping, Analytical techniques, Fractures (Geology).
Identifiers: *New Zealand, *North Canterbury, Tertiary rocks.

A sedimentological study of the Tertiary sediments of the Mandamus-Dove River area in North Canterbury, New Zealand, indicates that fluvial conglomerates and coal were the first sediments deposited on a Cretaceous peneplain developed on greywackes of the Torlesse Group. Subsequent cross-bedded glauconitic sands were deposited by north-flowing longshore currents following marine transgression in the area. Rapid build-up of bedded tuffs produced by volcanic activity to the northeast diverted longshore current sedimentation from the area and permitted an environment suitable for the growth of an algal-crinoidal-bryozoan biostrome. Cessation of volcanic activity and continuing basin subsidence halted biostrome growth and allowed renewed deposition of detritus by marine currents. (Gabriel-USGS)
W70-00644

RECENT SEDIMENTATION AROUND NORTHERNMOST NEW ZEALAND,
New Zealand Oceanographic Inst., Wellington. Dept. of Scientific and Industrial Research.
C. P. Summerhayes.
New Zealand J Geol and Geophys, Vol 12, No 1, p 172-207, May 1969. 36 p, 15 fig, 3 tab, 35 ref.

Descriptors: *Sediments, *Sedimentation, *Marine geology, *Continental shelf, *Provenance, Sea level, Water level fluctuations, Glaciation, Detritus, Organic matter, Mineralogy, Basalts, Algae, Pleistocene epoch, Erosion, Mapping.
Identifiers: *New Zealand, Recent continental shelf sedimentation.

Relict shallow water sediments, formed during the post-glacial rise in sea level, cover the continental shelf off northernmost New Zealand. Supplies of detrital sediment are negligible and biogenic skeltal debris is the only sediment component being supplied to the sea floor at present in any large quantity. Glauconite is forming over much of the region and active sediment movement is restricted to the nearshore environment. Detrital non-carbonate sediment in the eastern part of the region has a southern basaltic provenance; that to west and north has an andesitic provenance and is derived in part from the south and in part locally. On Maria Ridge are rich calcarenites which are forming slowly at present. On banks on the Ridge sedimentation is extremely slow and thick algal growths have accumulated around basalt pebbles left on Pleistocene marine erosion terraces. (Gabriel-USGS)
W70-00645

EARTHFLOW OCCURRENCE DURING HIGH INTENSITY RAINFALL IN EASTERN OTAGO (NEW ZEALAND),
Otago Univ., Dunedin (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 02B.
W70-00647

DIFFERENTIAL EQUATION OF THE EVOLUTION OF DELUVIAL SLOPES (IN RUSSIAN),
Kazan State Univ. (USSR). Dept. of Geography.
A. M. Trofimov, and Yu. P. Perevedentsev.
Vestnik Moskov Univ, Ser 5, Geogr, No 4, p 90-94, July-Aug 1969. 5 p.

Descriptors: *Geomorphology, *Mathematical studies, *Alluvium, *Slopes, *Erosion, Sedimentation, Profiles, Velocity, Deformation, Soil mechanics, Mathematical models, Geologic control, Land forming, Terrain analysis, Topography.
Identifiers: Deluvial slopes.

After briefly reviewing the contributions made by Strahler, Culling, Devdariani, Sheidegger, and others in the analytical studies of the evolution of deluvial slopes, a new analytical expression for the evaluation of a slope profile was proposed. This analytical expression gives the height of any profile point as a function of the horizontal distance and two empirical constants. In the final equation, the initial slope form is of considerable significance. (Gabriel-USGS)
W70-00648

CALCULATION OF SEDIMENT BALANCE OF THE LITTORAL ZONE (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 02L.
W70-00649

ENVIRONMENTALLY SIGNIFICANT SEDIMENTOLOGIC CHARACTERISTICS OF BEACH SANDS,
Geological Survey of New Zealand, Christchurch. Sedimentation Lab.
For primary bibliographic entry see Field 02L.
W70-00650

RELATIONSHIPS BETWEEN GRAIN SIZE, SIZE-SORTING, AND FORESHORE SLOPE ON MIXED SAND-SHINGLE BEACHES,
Canterbury Univ., Christchurch (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 02L.
W70-00651

SEDIMENTOLOGY OF THE WAITEMATA GROUP IN THE STANLEY POINT-DEVONPORT AREA, AUCKLAND, NEW ZEALAND,
Australian National Univ., Canberra. Dept. of Geology.
Brian G. Jones.
New Zeal J, Geol and Geophys, Vol 12, No 1, p 215-247, May 1969. 33 p, 16 fig, 2 tab, 21 ref.

Descriptors: *Sedimentation, *Sedimentology, *Stratigraphy, Sandstones, Silts, Currents (Water), Petrology, Model studies, Mapping, Structural geology, Scour, Petrography, Mineralogy, Analytical techniques, Detritus, Plankton, Diagenesis, Plants, Geology.
Identifiers: *New Zealand, *Auckland, Waitemata group.

A stratigraphic column shows the alternating sequence of sandstones and siltstones of the Lower Miocene Waitemata turbidite sediments, New Zealand. Descriptions of the sedimentary features, current direction indicators, grain size analyses, petrology, and trace fossils are given especially with regard to their use as possible correlation factors. The use of a model relating current direction variation within an expanding lobate turbidity current is discussed, together with its application for determining axial flow direction of the turbidity current and the direction of thickening of the turbidite sandstone. It is concluded that the best possible method of correlating the uniform sequence of unfossiliferous sediments available at present is by means of close-spaced detailed stratigraphic columns together with graphs of sandstone-siltstone ratio and bed thickness variations with respect to stratigraphic height. (Gabriel-USGS)
W70-00652

SEDIMENTARY FEATURES AND PENECONTEMPORANEOUS SLUMPING IN THE WAITEMATA GROUP, WHANGAPARAOA PENINSUAL, NORTH AUCKLAND, NEW ZEALAND,
Auckland Univ. (New Zealand). Dept. of Geology.
M. R. Gregory.
New Zeal J Geol and Geophys, Vol 12, No 1, p 248-282, May 1969. 35 p, 22 fig, 45 ref.

Descriptors: *Sedimentology, *Slope stability, *Turbidity currents, *Sedimentary structures, Detritus, Marine geology, Mapping, Currents (Water), Structural geology, Sandstones, Folds (Geology), Estuaries, Faults (Geology).
Identifiers: *New Zealand, *Auckland, Waitemata Group, Sedimentary features.

Rocks belonging to a turbidite facies of the Lower Miocene Waitemata Group are exposed extensively about Whangaparaoa Peninsula, New Zealand. Interbedded with this sequence are a number of thick, distinctive, volcaniclastic grits believed to have been emplaced by submarine lahars. These sediments accumulated towards the axial parts of a marine basin within a continental borderland. The turbidites were deposited by predominant southeast-flowing currents. Directions of weak bottom traction currents were more variable. Deformation and contortion of strata occur on a grand scale and are attributed to the penecontemporaneous slumping of poorly consolidated sediments in response to tilting of the sea floor. Injection of clastic dikes accompanied later stages of movement in slumped sequences. Evidence suggests that one great slump sheet extends over a distance of at least 10 miles from near Red Beach in the west to Whangaparaoa Head and possibly Tiritiri Matangi in the east. (Gabriel-USGS)
W70-00653

OPTICAL METHOD FOR DETERMINING PARTICLE SIZES OF COARSE SEDIMENT,
Geological Survey, Washington, D.C.
John R. Ritter, and Edward J. Helley.
Geol Surv Prelim Rep Tech Water-Resources Invest, Book 5, Chapter C3, 1969. 33 p, 11 fig, 8 tab, 8 ref.

Descriptors: *Analytical techniques, *Particle size, *Sediments, *Instrumentation, Volumetric analysis, Photography, Streambeds, Gravels, Sands, Computer programs.
Identifiers: *Optical methods, Particle-size analyzer.

Although the volumetric analysis of sandy bed material with the particle-size analyzer does not agree closely with analysis by the standard sieving technique, the volumetric analysis is better for gravel and coarser bed material than the Wolman areal method of analysis. Because of the speed with which the analysis can be made and the quantity of material used in the volumetric analysis, this method appears to be the best available for gravel. Furthermore, modern techniques of rapid data processing are applicable to the volumetric method of analysis. A computer program for processing particle-size data by the volumetric method has been written and used successfully. (Carstea-USGS)
W70-00655

AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN LANDSCAPE-GEOMORPHOLOGICAL FACTORS AND SEDIMENT RUNOFF OF THE RIVERS OF THE WESTERN TRANSCAUCASUS (IN RUSSIAN),
Moscow State Univ. (USSR).
L. F. Litvin.
Russian text with English summary. Vestnik Moskov Univ, Ser 5, Geogr, No 4, p 60-64, July-Aug 1969. 5 p, 4 fig.

Descriptors: *Sediment transport, *Streamflow, *Watersheds (Basins), *Geomorphology, Erosion, Slopes, Estuaries, Altitude, Geology, Sediment load, Vegetation effects, Weathering, Precipitation (Atmospheric).
Identifiers: *USSR, Transcaucasus.

A relationship between the total river transport and geomorphological parameters of river watersheds were investigated using hydrogeological data recorded at the three rivers of the Western Transcaucasus. The geomorphological parameters were assumed to be atmospheric precipitation, rock lithology, average watershed altitude, and stream slope patterns. High altitude zones and rock lithology are the most significant factors in sediment transport capacity of a river from the headwater to the mouth. (Gabriel-USGS)
W70-00656

OFF-SHORE SEDIMENTS, NORTH-WEST NELSON, SOUTH ISLAND, NEW ZEALAND,
New Zealand Oceanographic Inst., Wellington. Dept. of Scientific and Industrial Research.
For primary bibliographic entry see Field 02L.
W70-00660

THE APPEARANCE AND ORIGIN OF COLOURS IN MUDDY MARINE SEDIMENTS AROUND NEW ZEALAND,
New Zealand Oceanographic Inst., Wellington. Dept. of Scientific and Industrial Research.
For primary bibliographic entry see Field 02L.
W70-00661

DIAGENESIS, CHEMICAL SEDIMENTS, AND THE MIXING OF NATURAL WATERS,
Colorado Univ., Boulder. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02K.
W70-00674

ERODIBILITY OF SAND-CLAY MIXTURES AS EVALUATED BY A WATER JET,
Purdue Univ., Lafayette, Ind.
R. N. Rhasin, C. W. Lovell, Jr., and G. H. Toebes.
Available from the Clearinghouse as PB-187 272, $3.00 in paper copy, $0.65 in microfiche. Purdue University Water Resources Research Center Technical Report No 8, June 1969. 207 p, 42 fig, 31 tab, 99 ref. OWRR Project A-003-IND.

Descriptors: *Erosion control, Geomorphology, Clay, Graded, Stream stability, Cohesive soil, Particle size, Sand, Cohesionless soils, Soil stabilization, Abrasion.
Identifiers: *Erodibility, Water jet, Jet velocity.

Laboratory produced soil samples were subjected to erosion by means of 1/4 in. and 3/8 in. diam. submerged water jets. Special care was taken to control all variables that could effect the soil system behavior. The influence on erosion of the sample mixing and curing procedures, the grain size distribution and the ratio of constituent materials, including water content, was given attention. Samples were made from commercial clay (grundite) mixed with one or two grades of Ottawa Sand. Compaction pressures were 2.0 psi. Both the reate of weight loss due to erosion and undrained shear strength (using a laboratory vane) were determined. Obtained relationships between all named variables has been presented in both graphical and analytical form.
W70-00724

2K. Chemical Processes

INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
Amax Exploration, Inc., Vancouver (British Columbia); and Imperial Coll. of Science and Technology, London (England). Dept. of Geology.
For primary bibliographic entry see Field 02J.
W70-00422

URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
British Newfoundland Exploration Ltd.
For primary bibliographic entry see Field 02H.
W70-00424

NATURAL ORGANIC ACIDS IN THE TRANSPORTATION, DEPOSITION, AND CONCENTRATION OF GOLD,
Colorado School of Mines, Golden; and Geological Survey, Denver, Colo.
H. Ling Ong, and Vernon E. Swanson.
Quart Colo School of Mines, Int Geochem Explor Symp, Vol 64, No 1, p 395-425, Jan 1969. 31 p, 7 fig, 6 tab, 67 ref. Grant No 9300-146-67 (USGS).

Descriptors: *Gold, *Organic acids, *Streamflow, Deposition (Sediments), *Transportation, Water chemistry, Chlorides, Carbonates, Equilibrium, Lakes, Peat, Sulfates, Hydrogen, Ions, Analytical techniques, Carbon, Oxygen, Nitrogen, Colloids, Coagulation.
Identifiers: Gold compounds, Geochemical prospecting.

Geochemistry of gold in natural waters was investigated by using experimental studies and the results of earlier publications. Organic concentrations in the range of 3 to 30 ppm have the capacity to reduce gold chloride solutions to negatively-charged colloids of metallic gold. For the 30 ppm organic acid solutions, the reduction process is accomplished by the formation of a protective coating of hydrophobic gold sol making the gold very stable for a considerable time (at least 8 months). For smaller concentrations (3 ppm) of organic acid, the protective coating is not formed and the colloidal gold precipitates. In very acid solutions the presence of organic matter causes the reduction of gold chloride, and metallic gold of colloidal size is precipitated and intimately associated with the organic matter. In slightly acid to basic waters, that is in the general range of natural waters, gold can only be transported as stable organic-protected colloids. These organic-protected gold colloids are precipitated when they enter a different chemical environment (sea or brackish water) or when they enter an acid environment. (Gabriel-USGS)
W70-00425

OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
A. I. Germanov, I. P. Paseka, and P. M. Pylat.
Sovetskaya Geologiya, SSSR, Issue No 6, p 139-146, 1969. 8 p, 3 fig, 2 tab, 8 ref.

Descriptors: *Mineral water, *Oxidation, *Reduction (Chemical), *Groundwater, *Groundwater movement, *Springs, Organic matter, Water analysis, Carbonates, Calcium, Magnesium, Geologic mapping, Structural geology, Stratigraphy, Sediments, Geochemistry, Water temperature, Sulfates, Chlorine.
Identifiers: *USSR, Lvov, Ukraine.

Truskavets mineral spring in the Lvov area, Ukraine, was investigated on the basis of hydrological and hydrochemical data. Hydrodynamically the spring waters are associated with a small artesian groundwater basin located in one of the folds of a large anticline. The water-bearing zones are a sweet-water zone containing 0.7 to 0.9 gr/l of mineralized matter, a sodium, calcium-chlorine sulfate water zone containing 2.0 to 8.0 gr/l of mineralization, and a chloride-sodium zone of of high mineralization and salinity containing some hydrogen sulfide. Descriptions of the oxidation-reduction processes and the curative properties of the spring waters are also given. (Gabriel-USGS)
W70-00428

ON THE GEOCHEMISTRY OF UPPER PALEOZOIC AND LOWER MESOZOIC SEDIMENTS OF THE NORTHERN PART OF THE CISVERKHOYANSK TROUGH (RUSSIAN),
Akademiya Nauk SSSR. Institut Geologii.
A. F. Safronov.
Sovetskaya Geologiya, SSSR, Issue No 7, p 145-148, 1969. 4 p, 3 ref.

Descriptors: *Geochemistry, *Sediments, *Mesozoic era, *Paleozoic era, *Structural geology, Oil reservoirs, Gases, Organic matter, Carbon, Chemical analysis, Oxidation-reduction potential, Analytical techniques, Sulfur, Iron, Pyrite, Bituminous materials, Boreholes, Sands, Diagenesis.
Identifiers: *USSR, Verkhoyansk trough.

Sediments of the Cisverkhoyansk trough of northeastern Siberia were investigated on the basis of surface and borehole samplings for the evaluation of oxidation-reduction processes. The Upper Paleozoic and Lower Mesozoic sediments were developed in a weakly-oxidizing and strongly-reducing geochemical environment at depths of over 1500 m. It is conceivable that under optimal thermodynamical conditions these sediments could form hydrocarbons suitable for the development of gas and oil reservoirs. (Gabriel-USGS)
W70-00429

THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
Cape Town Univ. (South Africa). Dept of Physics, and Division of Sea Fisheries, Sea Point (South Africa).
R. D. Cherry, I. H. Gericke, and L. V. Shannon.
Earth and Planetary Sci Letters, Vol 6, No 6, pp 451-456, Sept 1969. 6 p, 1 fig, 1 tab, 24 ref.

Descriptors: *Radioisotopes, *Sea water, *Plankton, *Radiochemical analysis, Sampling, Tracers, Tracking techniques, Water chemistry.
Identifiers: *Thorium radioisotopes.

Data are given for thorium-228 in zooplankton, phytoplankton and sea water from seven different oceanographical water masses in the South Atlantic and around the Southern African coast. The levels in plankton are easily detectable. What appear to be real variations from one water mass to another were observed, and the possible utility of thorium-228 as a natural oceanographic tracer is noted. The levels in sea water are in general at or below the sensitivity level of the technique used, but for one set of samples a particularly high thorium-228 content was obtained. This set is from the Walvis Ridge area, and this region is particularly interesting in thorium and certain other trace elements. (Knapp-USGS)
W70-00434

OCEANIC CONCENTRATIONS OF RADIUM-228,
State Univ. of New York, Stony Brook. Dept. of Earth and Space Sciences.
Willard S. Moore.
Earth and Planetary Sci Letters, Vol 6, No 6, p 437-446, Sept 1969. 10 p, 5 fig, 3 tab, 10 ref. Grant AT (30-1)3629 (AEC).

Descriptors: *Water chemistry, *Sea water, *Radium radioisotopes, Mixing, Currents (Water), Water circulation, Tracers, Analytical techniques, Radiochemical analysis, Sampling.
Identifiers: Thorium radioisotopes.

This paper evaluates the worldwide oceanic distribution of Ra-228. Nearshore waters, especially waters from restricted bays and sounds, are very high in unsupported Ra-228. The concentrations decrease away from land. The Ra-228 content of surface waters bears a close correlation with the proximity to land. Samples from the Atlantic Ocean are higher than those from the Pacific Ocean. Apparently the source of Ra-228 in surface waters is diffusion from Th-232-bearing sediments in contact with these waters. Deep water samples collected less than 100 m from the sea floor have significant Ra-228 concentrations. Apparently Ra-228 is diffusing from deep-sea sediments as it is from nearshore sediments. Deep Pacific samples are generally lower than deep Atlantic samples. This may mean that Ra-228 released from Pacific sediments is mixed upward more rapidly, thereby decreasing the near-bottom concentrations. Intermediate water samples have less Ra-228 than either surface or bottom samples from the same area. These concentrations are near the lower limit of detection. Because the vertical mixing rate of the ocean is much greater than the mean life of Ra-228, little Ra-228 can penetrate into the intermediate ocean. (Knapp-USGS)
W70-00435

THE EXCHANGE OF HYDROGEN ISOTOPES BETWEEN ICE AND WATER IN TEMPERATURE GLACIERS,
Iceland Univ., Reykjavik. Science Inst.

Bragi Arnason.
Earth and Planetary Sci Letters, Vol 6, No 6, p 423-430, Sept 1969. 8 p, 3 fig, 1 tab, 17 ref.

Descriptors: *Water chemistry, *Glaciers, *Deuterium, Stable isotopes, Tritium, Tracers, Paleoclimatology, Mixing, Ice, Water, Melting, Freezing, Thermodynamics, Precipitation (Atmospheric).
Identifiers: Hydrogen isotopes, Isotope exchange, Temperate glaciers, Iceland.

Isotopic exchange between ice and water is found to take place in temperate glaciers. This exchange causes homogenization of deuterium in snow during summer thaws, together with a general increase in deuterium concentration. Ice in a temperate glacier is therefore more homogeneous and has a higher deuterium concentration than the precipitation on the glacier. The difference between the average deuterium concentration in ice and precipitation gives information about the runoff ratio. (Knapp-USGS)
W70-00439

HYDROLOGY OF SOUTH BONAIRE, N. A. - A ROCK SELECTIVE DOLOMITIZATION MODEL,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W70-00441

EXPERIMENTAL DISSOLUTION OF CALCIUM, MAGNESIUM, AND STRONTIUM FROM RECENT BIOGENIC CARBONATES: A MODEL OF DIAGENESIS,
George Washington Univ., Washington, D.C.
Johannes H. Schroeder.
J Sediment Petrol, Vol 39, No 3, p 1057-1073, Sept 1969. 17 p, 11 fig, 2 tab, 65 ref.

Descriptors: *Diagenesis, *Carbonate rocks, *Water chemistry, *Solubility, Bioindicators, Paleoclimatology, Calcium, Magnesium, Trace elements, Carbonates, Thermodynamic behavior, Laboratory tests, Leaching.
Identifiers: Biogenic carbonate deposits.

Laboratory experiments at ordinary temperature and pressure for periods up to 240 days on recent biogenic carbonate materials showed that fresh water and sea water dissolve aragonite and magnesium calcite prior to mineralogical changes. The observed rates of dissolution of calcium, magnesium, and strontium indicate that these elements are incorporated in aragonite and magnesium calcite in more than one way (in lattice positions, absorbed in lattice interstices, or as inclusions). This suggests the presence of more than one mineral phase in the skeletal material studied; these phases differ in response to solution, in quantity, and probably in chemical composition. Calcium, magnesium, and strontium are dissolved in proportions different from those in the original solid. The experimentally established sequence of preference is Mg, Ca, Sr. Factors found to determine direction and degree of incongruency in dissolution include mineralogy (number, kind, and relative abundance of phases present), chemical composition, physiologic effects (taxonomy and non-taxonomy related), and chemical composition and volume of waters effective in dissolution. Incongruent dissolution determines abundance of ions derived from solids in the diagenetic environment and hence, ion availability for precipitation in cement and for inhibition or catalysis in inversion or cement precipitation. Because of incongruent dissolution Mg and Sr contents of shells are not dependable for paleo-environmental analysis. (Knapp-USGS)
W70-00444

ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
Shell Development Co., Houston, Tex. Exploration and Production Research Div.; and Johns Hopkins Univ., Baltimore, Md. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W70-00445

RADIOMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF SELENIUM USING 3, 3' - DIAMINOBENZIDINE AS THE INITIAL REAGENT,
Missouri Univ., Kansas City. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W70-00460

DETERMINATION OF PHENOXY ACID HERBICIDES IN WATER BY ELECTRON-CAPTURE AND MICROCOULOMETRIC GAS CHROMATOGRAPHY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W70-00473

IMPLICATIONS OF THE MINOR ELEMENT CONTENT OF SOME MAJOR STREAMS OF THE WORLD,
Geological Survey, Washington, D.C.
W. H. Durum, and Joseph Haffty.
Geochim et Cosmochim Acta, Vol 27, p 1-11, 1963. 11 p, 6 fig, 4 tab, 16 ref.

Descriptors: *Trace elements, *Rivers, *Surveys, Water quality, Water chemistry, Geochemistry, Data collections, Solutes, Runoff, Aqueous solutions.
Identifiers: Geochemical river surveys, Minor elements.

Of 15 or more minor elements in the world's principal river waters only aluminum, iron, manganese, barium and strontium range much over 100 micrograms/liter. Most minor elements range at or below 100 micrograms/liter and have median (or middle) values of 10 micrograms per liter or less. Significant areal differences in minor element content are found in the river waters. For example, Atlantic Coastal river waters in the aggregate are slightly more enriched in concentrations of silver, chromium, manganese, molybdenum, nickel, strontium, and titanium, and slightly deficient in barium and lithium when compared with median values for North America. Median values of ration Ba/Sr. Ni/Cr and Ni/Cu are reasonably consistent (within a factor of two) in principal drainage from North America. Noteworthy are consistent median rations of Ni/Cu for large rivers of United States, but the ratio tends to be slightly greater in global northern latitudes than in southern latitudes. Median values for aluminum, barium, copper, lead, molybdenum and silver in North American runoff are of the same order as published world averages for ocean water. Hydrologic and geochemical aspects of continental runoff are strongly implied in observations of minor element content of large rivers. Evidence to date is that median values of Ba/Sr ratios are relatively uniform in global river waters. There is real danger in over simplifying chemical systems in broad assessments of lower reaches of large drainage basins because individual hydrologic and chemical events upstream are largely obscured. (Knapp-USGS)
W70-00478

A NOTE ON THE DEPENDENCE BETWEEN THE CONCENTRATION OF CHLORIDE IONS AND THE RADIOACTIVITY OF EMANATION DISSOLVED IN MINERAL WATERS (IN POLISH),
Warsaw Univ. (Poland). Faculty of Geophysics.
For primary bibliographic entry see Field 05A.
W70-00668

SOME CHARACTERISTICS OF THE WATERS OF GEORGIAN MUD VOLCANOES (IN RUSSIAN),
Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Institut Geologii.
M. F. Dzvelaya, and Ad. A. Aliyev.
Published in Russian with English and Georgian summaries. Soobshch Akad Nauk, Gruz SSR, Vol 54, No 1, p 121-124, Apr 1969. 4 p, 1 fig, 5 ref.

Descriptors: *Water chemistry, *Chemical properties, *Mudflows, *Volcanoes, Iron oxides, Mud, Carbonates, Chlorides, Alkaline water, Salinity, Mineral water, Sodium, Calcium, Potassium, Sulfates, Organic matter, Boron, Trace elements.
Identifiers: *Georgia SSR, Mud volcanoes.

The chemical composition of the waters of the mud volcanoes of Eastern Georgia, USSR, were investigated. Waters of the great majority of mud volcanoes are of the hydrocarbonaceous (sodium) type and of the chloride group. The waters of the Kila-Kuprinskiy mud volcano, however, are of a chlorine-calcium type, chloride group, and show deeper origin. The trace elements vary from 6.9-11.0 mg/l of iodine and 74.0 to 85 mg/l of boron in Kila-Kuprinskiy volcano, and 0.7 mg/l of iodine, 94.0 mg/l of bromine, and 16.0 mg/l of boron in the waters of Akhtal'skiy volcano. It is of interest to note that the presence of organic matter, boron, and iodine associated with an insignificant amount of sulfates in the waters of the mud volcanoes suggests some genetic association between the mud volcanoes and oil- and gas-bearing occurrences of Eastern Georgia. (Gabriel-USGS)
W70-00670

DIAGENESIS, CHEMICAL SEDIMENTS, AND THE MIXING OF NATURAL WATERS,
Colorado Univ., Boulder. Dept. of Geological Sciences.
Donald D. Runnells.
J Sediment Petrol, Vol 39, No 3, p 1188-1201, Sept 1969. 14 p, 7 fig, 1 tab, 83 ref.

Descriptors: *Chemical reactions, *Water chemistry, *Diagenesis, *Mixing, Solutes, Chemical precipitation, Aqueous solutions, Electrolytes, Ions, Ion exchange, Chemical degradation, Corrosion, Groundwater movement, Soil water movement, Leaching, Mineralogy.
Identifiers: Chemical sediments.

The chemical effects of mixing in the laboratory include changes in the concentration and electrical properties of a solution, shifts in homogeneous equilibria, and precipitation or dissolution of a solid phase. Similar chemical effects occur in nature as a result of the mixing of natural waters, and in some instances these may result in diagenesis. A simple classification yields 14 distinct categories of natural waters with 91 possible combinations of mixing of pairs of such waters. Examples are known of the precipitation of hydroxides and carbonates as a result of the mixing of chemically dissimilar surface waters. Because of the great variety of chemically dissimilar subsurface waters, plus the existence of potential fields which cause the movement of subsurface waters, mixing and diagenesis in the subsurface may be a common and significant geologic process. The solubility of rock forming minerals is a non-linear function of such independent variables as salinity, partial pressure of gases, temperature, and so on. The dissolution of calcium carbonate as a result of 'Mischungskorrosion' can be viewed in the light of the non-linearity of the solubility curve. Mixing of solutions which differ only in their content of dissolved electrolytes may cause either the precipitation or dissolution of rock-forming minerals. (Knapp-USGS)
W70-00674

BIOCHEMICAL OXYGEN DEMAND AND DEGRADATION OF LIGNIN IN NATURAL WATERS,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Div. of Technical Services.
For primary bibliographic entry see Field 05B.
W70-00681

CHEMICAL QUALITY OF STREAMS IN THE ERIE-NIAGARA BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
R. J. Archer, A. M. LaSala, Jr., and J. C. Kammerer.

NY State Water Resources Comm Basin Planning Rep ENB-4, 1968. 104 p, 18 fig, 1 plate, 24 tab, 24 ref, 2 append.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Surveys, *New York, Water chemistry, Solutes, Hardness (Water), Water pollution, Data collections, Hydrologic data.
Identifiers: Erie-Niagara Basin (NY).

The streams in the 2,000-square-mile Erie-Niagara basin of western New York contain mainly a calcium bicarbonate type of water with a dissolved-solids content generally between 140 and 240 ppm. The dissolved-mineral content of shallow groundwater is the principal influence upon the chemical quality of the streams, except during and soon after periods of dilution by heavy precipitation or snowmelt. The average dissolved-mineral content of precipitation is about 35 ppm of dissolved solids, but substantially higher concentrations, as much as 327 ppm, have occurred. These high concentrations are attributed to industrial air pollution in the Buffalo area. Chemical analyses of more than 700 samples collected mainly during 1963 and 1964, including samples of precipitation and overland flow are compiled. Maps and graphs show significant regional and time variations in the natural water quality. (Knapp-USGS)
W70-00688

2L. Estuaries

ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
Geological Survey, Washington, D.C.
Joseph P. Beverage, and Milton N. Swecker.
Geol Surv Water-Supply Pap 1873-B, 1969. 90 p, 55 fig, 8 tab, 39 ref.

Descriptors: *Estuaries, *Water quality, *Water resources, *Washington, Circulation, Tides, Currents (Water), Water pollution effects, Path of pollutants, Dissolved oxygen, Oxygen demand, Water pollution sources, Tracers, Dye releases.
Identifiers: *Grays Harbor (Wash), Water resources research.

Circulation patterns, water-quality conditions, and bottom material in upper Grays Harbor, Washington, were studied to improve water resource management. Salt water was found to intrude at least as far as Montesano, 28.4 nautical miles from the mouth of the harbor. Longitudinal salinity distributions were used to compute dispersion (diffusivity) coefficients ranging from 842 to 3,520 sq ft per second. These values were corroborated by half-tidal-cycle dye studies. The waters of the harbor were found to be well mixed after extended periods of low fresh-water flow but stratified at high flows. Velocity-time curves for the upper harbor are distorted from simple harmonic functions owing to channel geometry and frictional effects. Net separation distances between top and bottom water ranged from 1.65 nautical miles when freshwater inflow was 610 cfs to 13.4 miles when inflow was 15,900 cfs. The cumulative mean age from integration of the fresh-water velocity equation was about twice that obtained from the salinity distribution. Carbon content was low upstream and downstream of the upper harbor area, and high in the Cow Point-Rennie Island reach. The high-carbon-content reach coincides with the general area of a dissolved-oxygen sag. At Cosmopolis, the daily minimum dissolved oxygen content correlated well with discharge and tidal range. The upper harbor was found to contain 250 million cubic feet less water than average during the critical low-flow period, on the basis of the frequency distribution of predicted tides. About 78,000 pounds of dissolved oxygen is thus available for oxidation of waste during summer. (Knapp-USGS)
W70-00419

THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
Cape Town Univ. (South Africa). Dept of Physics, and Division of Sea Fisheries, Sea Point (South Africa).
For primary bibliographic entry see Field 02K.
W70-00434

OCEANIC CONCENTRATIONS OF RADIUM-228,
State Univ. of New York, Stony Brook. Dept. of Earth and Space Sciences.
For primary bibliographic entry see Field 02K.
W70-00435

THE ROLE OF MARINE SCIENCES IN THE MULTIPLE USES OF THE COASTAL ZONE OF LAKE ERIE AND LAKE SUPERIOR,
National Planning Association, Washington, D.C. Center for Techno-Economic Studies.
Miller B. Spangler.
Available from Clearinghouse as PB 185 163 for $3 in paper copy, 65 cents in microfiche. Rep of Techno-Econ Studies Center, Nat Planning Ass, June 1969. 391 p, 7 fig, 10 tab, 8 append.

Descriptors: *Multiple-purpose projects, *Planning, *Great Lakes, *Water resources development, *Water pollution control, Lake Erie, Lake Superior, Water pollution treatment, Recreation, Industrial water, Municipal water, Navigation, Governments, Legislation, Water management (Applied).
Identifiers: Multiple shoreline uses (Great Lakes).

A study was made to identify measures in marine sciences which can be applied to the promoting of optimum use of the coastal zone of the Great Lakes. Lake Superior and Lake Erie were selected for study to illustrate the contrast of problems and opportunities in utilizing the waters and shoreline resources of the Great Lakes system. Lake Superior is the largest and deepest of the Great Lakes and with a few local exceptions is still basically of pristine character. Lake Erie by contrast, is the smallest and shallowest lake in the system, and with its intensively developed shoreline and hinterland has suffered probably the most extreme degradation of environmental quality. The analysis of these conditions has lead to the conclusion that the priority emphasis for action should be directed toward preservation of the essentially undeteriorated resources of Lake Superior, and to combating the further deterioration and restoration of the quality of resources of Lake Erie. A major conclusion of this study is that Lake Erie, far from being a 'dead Lake,' is capable of a significant degree of restoration of environmental quality if the sources of pollution entering Lake Erie are brought under effective control. Because of the relative shallowness of Lake Erie, the present rate of outflow into Lake Ontario discharges a total volume of water in only 2 1/2 yr equal to the volume of water contained in Lake Erie, which suggests that improvements in water quality could be achieved in a relatively few years. Recommendations are made to reinforce or to encourage reconsideration of essential actions leading to potentially new or expanded developments of coastal zone resources, particularly in those areas where regional, national, and international benefits may be forthcoming from a strengthened marine sciences program. (Knapp-USGS)
W70-00457

A DIVERSIFIED PROGRAM FOR THE STUDY OF SHALLOW WATER SEARCHING AND MAPPING TECHNIQUES,
Pennsylvania Univ., Philadelphia. Univ. Museum.
For primary bibliographic entry see Field 07B.
W70-00461

AN EXPERIMENTAL IN SITU DENSITOMETER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
For primary bibliographic entry see Field 07B.
W70-00462

OPTICAL OCEANOGRAPHY,
Copenhagen Univ. (Denmark). Inst. of Physical Oceanography.
For primary bibliographic entry see Field 07B.
W70-00464

ESTUARINE LAND OF NORTH CAROLINA: LEGAL ASPECTS OF OWNERSHIP, USE, AND CONTROL,
For primary bibliographic entry see Field 06E.
W70-00565

APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
Syracuse Univ. Research Corp., N.Y.
For primary bibliographic entry see Field 07B.
W70-00636

TIDAL FLAT EROSION BY ICE AT LA POCATIERE, ST. LAWRENCE ESTUARY,
Department of Fisheries and Forestry, Sillery (Quebec).
Jean-Claude Dionne.
J Sediment Petrol, Vol 39, No 3, p 1174-1181, Sept 1969. 8 p, 9 fig, 23 ref.

Descriptors: *Erosion, *Mud flats, *Ice, *Ice breakup, *Estuaries, Beach erosion, Bank erosion, Tidal marshes, Silts, Clays, Sedimentation, Sediment transport.
Identifiers: St. Lawrence estuary (Canada), Tidal flats.

The tidal flat areas of the Middle St. Lawrence Estuary are severely eroded by shore ice. Grooves parallel or perpendicular to the shoreline, measuring 30 to 80 cm wide, 20 to 35 cm deep, and 1500 to 2000 m long, and circular or subcircular basins up to 2 m in diameter and 20 to 40 cm deep are produced every spring by ice blocks that plow the surface and greatly disturb the sediments. (Knapp-USGS)
W70-00640

APPLICATION OF THE SPECTRAL ANALYSIS METHOD TO THE PRE-ESTIMATION OF TIDES (IN RUSSIAN),
Nguyen Ngoc Thuy.
Vestnik Moskov Univ, Ser 5, Geogr, No 4, p 118-121, July-Aug 1969. 4 p, 2 fig, 12 ref.

Descriptors: *Tides, *Mathematical studies, *Forecasting, Water level fluctuations, Sea level, Computers, Frequency analysis, Waves (Water), Velocity.
Identifiers: South China Sea, Spectral analysis.

The applicability of the spherical harmonics method to the study of tides of the South China Sea was investigated. Using a few sea-level observations and the auto-correlation technique on electronic computers, a spectral function of the tides of the South China Sea was obtained. The spectral function yields the predominant wave types, daily components, and energy. (Gabriel-USGS)
W70-00643

STRATIGRAPHY AND SEDIMENTOLOGY OF THE TERTIARY ROCKS OF THE MANDAMUS-DOVE RIVER AREA, NORTH CANTERBURY, NEW ZEALAND,
Pennsylvania Geological Survey, Harrisburg.
For primary bibliographic entry see Field 02J.
W70-00644

RECENT SEDIMENTATION AROUND NORTHERNMOST NEW ZEALAND,
New Zealand Oceanographic Inst., Wellington. Dept. of Scientific and Industrial Research.
For primary bibliographic entry see Field 02J.

W70-00645

THE PROPOSED SOLWAY FIRTH BARRAGES: A REVIEW OF THE GEOLOGICAL AND GEOTECHNICAL ASPECTS,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia).
For primary bibliographic entry see Field 04A.
W70-00646

CALCULATION OF SEDIMENT BALANCE OF THE LITTORAL ZONE (IN RUSSIAN),
Moscow State Univ. (USSR).
G. A. Saf'yanov.
Vestnik Moskov Univ, Ser 5, Geogr, No 4, p 121-122, July-Aug 1969. 2 p, 1 fig. Russian text with English summary.

Descriptors: *Sediment transport, *Sedimentation, *Littoral drift, Sedimentation rates, Gages, Mathematical studies, Surveys, Forecasting, Topography, Slopes, Sediment discharge.
Identifiers: Littoral zone, Sediment balance.

The sediment balance of a coastal section is determined by the difference between the sediment income of the section and its drifting outside the section. If a repeated measurement is made on the coastal section by fixed gage lines, it is possible to estimate the drift balance for the period between the two measurements. Drift balance is determined as an integral of the function describing changes of the relief (in cross section) along the water edge during the period between surveys. (Gabriel-USGS)
W70-00649

ENVIRONMENTALLY SIGNIFICANT SEDIMENTOLOGIC CHARACTERISTICS OF BEACH SANDS,
Geological Survey of New Zealand, Christchurch. Sedimentation Lab.
Peter B. Andrews, and G. J. Van der Lingen.
New Zeal J Geol and Geophys, Vol 12, No 1, p 119-137, May 1969. 19 p, 11 fig, 2 tab, 29 ref.

Descriptors: *Sediments, *Marine geology, *Beaches, *Sands, Slopes, Scour, Petrology, Stratigraphy, Statistical methods, Mapping, Detritus, Gravels, Frequency analysis, Texas.
Identifiers: New Zealand, Beach sands.

Comparative study of 5 South Island, New Zealand beaches and a beach on the central Texas coast suggests a short list of features that are diagnostic of the coastal beach. Beach sediments are clean (no mud matrix) and are very well to moderately well sorted. Foreshore strata occur as even, internally laminated, thin beds that dip seaward at low angles. The angle of dip is directly related to the slope of the foreshore surface, which in turn is largely dependent upon the mean size of the beach sediment; that is, the coarser the grain size the steeper the foreshore. Backshore strata occur as lense and slightly wedge-shaped internally laminated thin beds. Scour surfaces and cross-stratified lenses are characteristics. Dip of strata varies from 0 deg to 15 deg, and strata dip directly or obliquely landward. A transition zone (foreshore or above high tide level plus outer backshore) is characterized by mixed foreshore and backshore stratification, and some strata dip landward, others dip seaward. Many beaches furnish positively skewed distributions. It is concluded that skewness is not necessarily an environment-sensitive measure, and that skewness values commonly reflect grain size characteristics inherited from the source rocks. (Gabriel-USGS)
W70-00650

RELATIONSHIPS BETWEEN GRAIN SIZE, SIZE-SORTING, AND FORESHORE SLOPE ON MIXED SAND-SHINGLE BEACHES,
Canterbury Univ., Christchurch (New Zealand). Dept. of Geography.
R. F. McLean, and R. M. Kirk.
New Zeal J Geol and Geophys, Vol 12, No 1, p 138-155, May 1969. 18 p, 7 fig, 2 tab, 22 ref.

Descriptors: *Sediments, *Marine geology, *Beaches, *Sands, Slopes, Statistical methods, Computers, Hydraulic properties, Waves (Water), Permeability, Fluid mechanics, Analytical techniques, Frequency analysis, Sedimentary structures.
Identifiers: *New Zealand, South Island.

The variation of mean grain size, sorting, and beach face slope over mixed-sand shingle beaches at 2 areas along the east coast, South Island, New Zealand, is analyzed to determine the nature of the relationships between these 3 variables. The study is confined to mean grain sizes between 0.25 and 16.0 mm, and the sorting and slope values associated with this range of sizes. Trend analysis of the data has been performed by fitting curves with the aid of a computer. It is demonstrated that for given beaches curvilinear trends in size/sorting are reflected in slope/size relationship. Thus, the best sorted sediments are found to be associated with the steepest gradients on the curves, while zones of poor sorting are associated with 'plateaus' in the size/slope trend. It is suggested that size is the primary control of sorting trends in the sediments examined while hydraulic effects contribute to variability or spread of the data around the trend. Since size and sorting exert a primary influence on the beach face slope through permeability, it is further suggested that, for the study beaches at least, trends in the size/slope relationship clearly reflect the characteristics local distributions of size and sorting. (Gabriel-USGS)
W70-00651

OFF-SHORE SEDIMENTS, NORTH-WEST NELSON, SOUTH ISLAND, NEW ZEALAND,
New Zealand Oceanographic Inst., Wellington. Dept. of Scientific and Industrial Research.
William J. M. Van der Linden.
New Zeal J Geol and Geophys, Vol 12, No 1, p 87-103, May 1969. 17 p, 11 fig, 2 tab, 15 ref.

Descriptors: *Sediments, *Provenance, *Marine geology, *Currents (Water), *Continental shelf, Erosion, Streamflow, Rivers, Winds, Sands, Petrology, Sedimentation rates, Pleistocene epoch, Bathymetry, Seismic studies, Sampling, Mathematical studies, Mineralogy.
Identifiers: *New Zealand.

The Kahurangi Shoals, north-west of Kahurangi Point, Nelson, and the Westland and D'Urville Currents are the major factors influencing the sediment distribution and sedimentation processes on the north-western shelf of the South Island, New Zealand. The sediments are derived from two major sources, one the Kahurangi Shoals, the other the high Alpine region which supplies its erosion products to sea by steep mountain streams and rivers. The Westland and D'Urville Currents not only carry the Alpine detritus to the area but also largely control the sediment distribution pattern. Immediately south and north of Farewell Spit well sorted wind-blown sands derived from the Spit have accumulated, whereas further south in Golden Bay the sediments are mainly supplied by the Aorere and Takaka Rivers. Petrologically the shelf sands are mainly a quartz-feldspar association with magnetite, ilmenite, garnet, and hornblende as major constituents in the heavy mineral assemblage. The gravels and boulders derived from the Kahurangi Shoals consist mainly of well rounded quartzites. Seismic reflection profiles give an indication of the depositional history during and since the Pleistocene and provide information on the rate of sedimentation. (Gabriel-USGS)
W70-00660

THE APPEARANCE AND ORIGIN OF COLOURS IN MUDDY MARINE SEDIMENTS AROUND NEW ZEALAND,
New Zealand Oceanographic Inst., Wellington. Dept. of Scientific and Industrial Research.
H. M. Pantin.
New Zeal J Geol and Geophys, Vol 12, No 1, p 51-66, May 1969. 16 p, 1 fig, 2 tab, 9 ref.

Descriptors: *Sediments, *Color, *Marine geology, *Geochemistry, Sampling, Chemical analysis, Absorption, Organic matter, Iron compounds, Silicates, Manganese, Mapping, Mud, Analytical techniques, Sedimentation.
Identifiers: *New Zealand.

Muddy marine sediments in the New Zealand region show a considerable range of color. Thirty-five representative samples were selected and divided into groups. Simple chemical tests were applied to these samples in order to obtain information regarding the nature of the chemical compounds which control the color of these sediments. The color of the sediments appears to be controlled mainly by adsorbed compounds of various types. These compounds include: (a) a particular type of organic matter, which gives rise to an olive hue; (b) certain iron compounds (probably silicates) which contain exchangeable ferric iron, and are sometimes partly responsible for an olive hue; (c) ferric oxide or hydroxide, which gives rise to orange, yellowish brown or yellow hues; and (d) manganese dioxide, which also gives rise to orange or yellowish brown hues but which produces considerably darker sediments than ferric oxide or hydroxide. (Gabriel-USGS)
W70-00661

COMPARATIVE ECOLOGY OF SANDSPIT PONDS,
Oberlin Coll., Ohio. Dept. of Biology.
Edward J. Kormondy.
The Amer Midland Natur, Vol 82, No 1, p 28-61, July 1969. 34 p, 9 fig, 10 tab, 53 ref.

Descriptors: *Lakes, *Ecology, *Ponds, *Sand spits, Lagoons, Lake Erie, Organic matter, Vegetation, Plant population, Alkaline water, Carbonates, Water chemistry, Phytoplankton, Seasonal, Carbon radioisotopes, Productivity, Invertebrates, Oxygen, Photosynthesis, Mapping.
Identifiers: Sand spit pond ecology, Presque Island (Pa).

Limnology, productivity and community metabolism of a series of beach and lagoon ponds, located on a sandspit in Lake Erie, Pennsylvania, were investigated by using chemical, biological and geological techniques. Organic matter which has accumulated to a maxi-m-m of 0.8 m in one pond, results in reduction of size approximately 60% and 95% in 50 and 75 yr, respectively. Significant macrovegetational characteristics include the replacement of initial colonizers and the appearance of floating-leaved species in 30 or 40 yr. The ponds are all moderately to well buffered alkaline systems with medium to high levels of carbonates. Phytoplankton density is greatest in late July to early August with the species diversity greatest in midsummer. Annual net productivity is lower in older beach ponds, and standing crop of chlorophyll 'a' showed considerable variation annually and by stage of succession. Colonization by invertebrates is via secondary invasion subsequent to the establishment of the ponds. Community metabolism showed a change in the ratio of photosynthesis to respiration from 1.0 in the youngest pond to 0.33 in the oldest pond. (Gabriel-USGS)
W70-00671

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

POWER, WATER AND FOOD FOR DESERT COASTS: AN INTEGRATED SYSTEM FOR PROVIDING THEM,
Arizona Univ., Tucson. Environmental Research Lab.
Carl N. Hodges, and Carle O. Hodge.

Amer Soc Hort Sci, 66th Ann Meet, Pullman, Wash, Aug 20-22, 1969. Paper, 16 p, 4 fig, 3 tab, 11 ref.

Descriptors: *Arid lands, *Water supply, *Desalination, *Evaporation control, *Vegetable crops, Electric power, Greenhouses, Desalination apparatus, Sea walls, Sea water, Water resources development.
Identifiers: *Gulf of California, *Abu Dhabi, Arabian Peninsula, Diesel generators.

The world has about 20,000 miles of arid coastline with 2.6 million square miles of adjacent arid land 100 feet or less above sea level (a reasonable lift to provide fresh water if it could be obtained economically from the ocean). While much of this land has a sparse population and little or no cultivation, because of the shortage of fresh water, could be productive and habitable if power, food and fresh water were available. Work started in 1966 to design an integrated power-food-water production system for such locations. An integrated, closed environment system was developed utilizing waste heat from diesel-electric generators to desalt sea water. The fresh water is utilized to grow vegetables in air-inflated greenhouses. A pilot plant on the Gulf of California is providing power, water and high quality vegetables for a small fishing community. A large-scale installation is being designed in the Arabian Peninsula Shaikdom of Abu Dhabi. (Crouse-Arizona)
W70-00694

PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
Booz-Allen Applied Research, Inc., Bethesda, Md.
A. P. Christodoulou, G. R. Olsson, and M. J. Monnik.
Office of Saline Water Research and Development Report No 488, 1969. 188 p. OSW Contract 14-01-0001-1825.

Descriptors: *Desalination, *Electrodialysis, *Membrane Processes, Cost Optimization, Plant Design.
Identifiers: *Desalination Apparatus, *Electrochemistry, Computer Algorithm, Economics.

A parametric engineering and economic analysis of the electrodialysis process was performed in which water costs were examined for the demineralization of three reference brackish waters in plant sizes from 1 to 50 mgd. Capital costs were based on scaled-up two-meter stack designs of both the tortuous path and sheet flow types and on detailed plant designs. Operating costs were based on both state-of-the-art technology and on projected technological improvements in critical components and process parameters. A computational algorithm for electrodialysis process analysis and costing was developed and programmed. (Mintz-Office of Saline Water)
W70-00726

ECONOMIC EFFECTS OF USING SUBSTANDARD QUALITY WATER IN WEBSTER AND OTHER COMMUNITIES IN SOUTH DAKOTA.
South Dakota State Univ., Brookings. Coll. of Agriculture and Biological Sciences.
For primary bibliographic entry see Field 03C.
W70-00727

3B. Water Yield Improvement

LAND USE ALONG A TROPICAL CLIMATIC BOUNDARY: THE WALAWE GANGA BASIN OF CEYLON,
National Academy of Sciences-National Research Council, Washington, D.C.
Simon Baker.
Available from Clearinghouse as AD-679 458 for $3 in paper copy, 65 cents in microfiche. Final Rep of Nat Acad Sci-Nat Res Counc, 1968. 251 p, 40 fig, 7 tab, 93 ref. N00014-67-A-0244-0001.

Descriptors: *Land use, *Climatology, *Synoptic analysis, *Rural areas, Tropical regions, Humid areas, Arid lands, Wet climates, Climatic zones, Aerial photography, Surveys, Topography, Mapping.
Identifiers: *Ceylon, Walawe Ganga Basin, Climatic boundaries.

The Walawe Ganga Basin of southern Ceylon, lying partly in the dry and wet zones, is an area which has been earmarked for large-scale development and for settlement of population from the more crowded portions of the wet zone of the Island. It is generally recognized that the wet zone-dry boundary passes through this basin. None of the accepted criteria for the delineation of this boundary agree as to its location in the basin. A major purpose of this study is to show the exact location of the boundary as determined by observations of land use and vegetation types on aerial photographs and in the field. The relationship and influence on the location of the boundary of topography, relief, quantity, and seasonal distribution of rainfall are also examined. Land use throughout the Walawe Ganga Basin and several adjoining areas has been mapped in great detail for the first time. A planimetric analysis of the land use types in the climatic zones shows the quantitative and distributional differences in them. Field observations and interpretation of aerial photographs provide the background for a discussion of qualitative differences between land use types in the climatic zones. A study of the history of land use in the basin over the past 2500 yr indicates previous responses to the physical environment of the basin. (Knapp-USGS)
W70-00463

MICRO-IRRIGATION BY CATCHMENT TANK,
M. G. Ionides.
Ekistics, Vol 24, No 142, p 252-255, 1967. 1 fig.

Descriptors: *Arid lands, *Irrigation, *Water yield improvement, *Impervious membranes, Dry farming, Water supply, Water storage, Semiarid climates, Microenvironment, Water harvesting.
Identifiers: *Catchment tanks, *Micro-irrigation, *Sudan, *Gardens, *Food production.

Attention is drawn to the desirability of developing small catchment and storage system for the irrigation of kitchen gardens as a means of supplying fresh vegetables and fruits to peasant families in semiarid developing countries. Fifty gallons of water a day can provide 10 lbs. of vegetables and fruits daily. Although this is more than might be carried from a village well or spring, it might be provided by a lined and covered tank in the ground with a prepared catchment apron. The successful trial of such a system in the Sudan is discussed. Although the growing season was dry, there was sufficient precipitation at other times to fill the tank. (Crouse-Arizona)
W70-00701

POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS: NORTHWEST INDIA, A CASE FOR STUDY,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 02B.
W70-00702

WATER RESOURCES PLANNING IN AUSTRALIA,
Adelaide Univ. (Australia). Faculty of Architecture and Town Planning.
For primary bibliographic entry see Field 06B.
W70-00704

SNOWPACK MANAGEMENT,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 02C.
W70-00763

3C. Use of Water of Impaired Quality

ECONOMIC EFFECTS OF USING SUBSTANDARD QUALITY WATER IN WEBSTER AND OTHER COMMUNITIES IN SOUTH DAKOTA.
South Dakota State Univ., Brookings. Coll. of Agriculture and Biological Sciences.

Office of Saline Water Research and Development Progress Report No 463, Oct 30, 1969. 192 p. OSW Contract 14-01-0001-463.

Descriptors: Chemical analysis, *Mineral water, *Water softening, Saline water, Brackish water, Desalination, Electrodialysis, Water quality, *Water supply, Costs, Economics, Evaluation, *Economic efficiency.

Webster, S.D., (population 2,500) was one of five sites chosen by the Office of Saline Water for the construction of a desalination demonstration plant. Since 1962, Webster's municipal water supply has been primarily made up of the product water from a 250,000 gpd electrodialysis facility. The purpose of the study was to compare the municipal use of the water before and after the changeover from brackish water to a municipal supply of reduced mineral content. More specific objectives were to compute identifiable cost items related to the use of centrally softened brackish water versus the use of demineralized water. Replacement costs were sharply reduced for hot water heaters installed after 1962. Fifteen other S.D. communities were likewise surveyed. Agreement among users was not clearly unanimous. To the native housewife softness was more important than generally low mineral content. Institutional and commercial users distinctly preferred the demineralized water. (Bovet-Office of Saline Water)
W70-00727

3D. Conservation in Domestic and Municipal Use

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 1 INTRODUCTION,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W70-00528

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 6 STATUTORY MODIFICATIONS OF EASTERN CONSUMPTIVE USE DOCTRINES,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W70-00533

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 13 A LOOK TO THE FUTURE,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W70-00540

DEPARTMENT OF CONSERVATION.
For primary bibliographic entry see Field 04C.
W70-00583

AN ENVIRONMENT FIT FOR PEOPLE,
For primary bibliographic entry see Field 06G.
W70-00603

MICRO-IRRIGATION BY CATCHMENT TANK,
For primary bibliographic entry see Field 03B.
W70-00701

3F. Conservation in Agriculture

IRRIGATION IN KENTUCKY AS AFFECTED BY THE LAW OF RIPARIAN RIGHTS,
Hugh C. Evans.
Ky L J, Vol 40, No 4, p 423-433, May 1952. 11 p, 32 ref.

Descriptors: *Kentucky, *Riparian rights, *Irrigation, *Reasonable use, Natural use, Prior appropriation, Natural flow doctrine, Artificial use, Irrigation water, Legal aspects, Usufructuary right, Water law, Judicial decisions, History, Obstruction to flow, Remedies, Water policy, Irrigation districts, Diversion.
Identifiers: *Common law.

Irrigation is becoming increasingly important to the Kentucky farmer. Recent studies show that present economic conditions may necessitate the expanded use of irrigation in the future. This development will undoubtedly present substantial legal problems arising under the Kentucky law of riparian rights. Although the Kentucky court is committed to the natural flow theory, it has on occasion applied what amounts to a reasonable use theory. Although no decision has distinguished which of these theories will be applied to irrigation, case law seems to suggest that Kentucky will follow a rule somewhere between these two theories. This conclusion is drawn after analyzing in detail the two relevant cases decided by the Court of Appeals of Kentucky. The author proposes various hypothetical cases and suggests what the court would do if presented with such a situation. These examples appear to favor the future legal status of irrigation. It is proposed that a solution employing these existing theories would make unnecessary local statutory adoption of any new doctrine of water use, such as the theory of prior appropriation. (Schram-Florida)
W70-00571

REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
Illinois Univ., Urbana; and International Rice Research Inst., Los Banos (Philippines).
J. C. Headley, and V. W. Ruttan.
IN Economics and Public Policy in Water Resource Development, Ames, Iowa State University Press, p 127-149, 1964. 23 p, 2 fig, 3 tab, 5 append, 19 ref. Edited by S. C. Smith, and E. N. Castle.

Descriptors: *Irrigation, *Water allocation, *Economic analysis, *Water resources development, Correlation analysis, Randomness, Investment, Lime, Fertilizer, Humid area, Arid lands, Groundwater, Technology.
Identifiers: *Aggregate production function, *Farm output, *Empirical investment, *Economic growth, Elasticity, Cropland, Cobb-Douglas function, Coefficients, Bias.

This article represents a preliminary report on an attempt to use aggregate production functions to construct estimates of regional differences in the productivity of irrigated cropland. The aggregate production function is discussed with a note of its limitations. Regional production elasticity and marginal productivity estimates are presented and two illustrations demonstrate how the results can be used to assess the impact of irrigation development on the growth of farm output. Statistical estimates of irrigation productivity are given for major agricultural regions in the U.S., indicating reliable quantitative estimates of factor productivity coefficients and marginal productivity estimates in most areas. Only the direct irrigation benefits were dealt with, leaving a need for cost analysis in all areas. Incremental increases in irrigation inputs were studied in both humid and arid regions. The analysis emphasized broad possibilities of substitution among aggregate input categories to achieve given output levels in each region. (Murphy-Rutgers)
W70-00624

IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
Central Michigan Univ., Mount Pleasant.
James Hudson.
Chicago, University of Chicago, 1963. 249 p.

Descriptors: *Water supply, *Irrigation, *Economics, *Land use, *Utilities, *Water management, Agriculture, Population, Income, Farms, Climates, Natural flow, Financing, Prices, Costs, Water yield, Irrigation efficiency, Water rates, Reservoirs, Wells, Springs.
Identifiers: *Utah Valley, *Water companies.

This study attempts to describe the water use management practices important to irrigation water use and to canvass the whole range of factors, physical, economic and institutional, which affect water use and the variations of water use in a particular area. It provides an estimate of the actual water use and irrigation efficiencies in the valley. The problems of measurement of efficiency are discussed and the results of different available measures are compared. It examines the conditions in the area which encourage or hinder changes in irrigation water use. Of particular interest to the economist is the section which examines the irrigation water companies as the intermediate step between surface supply and the farmers. (Murphy-Rutgers)
W70-00627

ADVECTIVE CONTRIBUTION OF ENERGY UTILIZED IN EVAPOTRANSPIRATION BY ALFALFA IN THE EAST CENTRAL GREAT PLAINS (U.S.A.),
Nebraska Univ., Lincoln. Agricultural Experiment Station; and Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 02D.
W70-00690

AGRICULTURAL METEOROLOGY IN ISRAEL,
Nebraska Univ., Lincoln.
Norman J. Rosenberg.
American Meteorological Society, Bulletin, Vol 50, No 6, p 444-445, June, 1969. 2 fig.

Descriptors: *Micrometeorology, *Arid lands, *Water utilization, *Irrigation, *Agriculture, Windbreaks, Energy budget, Greenhouses, Environmental effects, Soil temperature, Deserts.
Identifiers: *Agrometeorology, *Israel.

The author presents a brief review of the state of research on micrometeorological and environmental effects in agricultural research in Israel as of 1968. Research is directed toward optimization of water use in irrigated agriculture. Instrumentation was somewhat less sophisticated than that in Europe and the United States. Extensive work was in progress to develop efficient use of windbreaks and greenhouses as well as soil covers to control soil temperature and evaporation and to extend the growing season for high value specialty crops. The author concluded that Israel, with an arid climate and severely limited water supply, could benefit greatly from continued agrometeorological research. (Crouse-Arizona)
W70-00691

THE QANATS OF IRAN,
For primary bibliographic entry see Field 04B.
W70-00692

THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W70-00693

SPRINKLER IRRIGATION,
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.; California Univ., Los Angeles. Water Resources Center; and International Study Center for Sprinkler Irrigation, Verona (Italy).
Arthur F. Pillsbury, and Ariosto Degan.
Food and Agriculture Organization of the United Nations, FAO Agricultural Development Paper No. 88, 1968. 179 p, 66 Fig, 15 Tabs, 9 graphs, 87 ref, 4 append.

Descriptors: *Sprinkler irrigation, *Irrigation design, Irrigation operation and maintenance, Economic feasibility, Arid lands, Construction costs, Cost-benefit ratio, Operating costs, Depreciation, Hydraulic design.

Irrigation can be used as a supplement in arid zones as a substitute for natural rainfall to supply soil moisture for growing plants and, sometimes, to control surface temperatures. Subsurface, surface, and sprinkler application methods can be used. Sprinkler methods offer greater uniformity of coverage, frequently at lower application rates. This paper presents a broad review of situations in which sprinkler irrigation should or should not be used. It examines factors that affect system performance and design criteria of which the planner should be aware when designing an irrigation system. Special uses such as fertilizer and pesticide application and frost protection are discussed. The most obvious applications are in arid or semi-arid zones or in areas where natural precipitation is inadequate or unpredictable during the growing season. Since farming is a business, an irrigation system should not be installed unless estimated increase in value of product exceeds direct and indirect costs of installations and operation. Discussion of costs includes suggested depreciation periods for various system components, interest rates, and data for estimating operating and maintenance costs. (Crouse-Arizona)
W70-00695

NOTES ON PROBLEMS OF IRRIGATION IN THREE LIBYAN OASES,
For primary bibliographic entry see Field 04B.
W70-00703

IRRIGATION IN THE AMU-DAR'YA BASIN: PROGRESS REPORT,
Ann Sheehy.
Central Asian Review, Vol 15, No 4, p 342-353, 1967. 1 map.

Descriptors: *Arid lands, *Irrigation systems, *Irrigation canals, *Canal seepage, *Drainage systems, Land development, Hydroelectric power, Saturated soils.
Identifiers: *Central Asia, *Amu-Dar'ya Basin, U.S.S.R., Aral Sea.

The article, compiled from Russian language newspapers and journals, deals with irrigation developments in the Amu-Dar'ya Basin as reported between 1963 and 1967. Citations of original articles are not always included. The Amu-Dar'ya empties into the Aral Sea. About two-thirds of the average annual flow (70 milliard cubic meters) reaches the Aral Sea, but current plans are to divert almost all of the water for irrigation by 1980. Structures will be multi purpose and also generate electricity, part of which will be used to lift irrigation water where necessary and the rest made available for urban-industrial development. The various projects in operation, under construction and in planning stages are reviewed briefly and individually. Many projects are apparently running behind schedule due to excessive losses from seepage from canals, inadequate provision for drainage of newly developed lands, and inadequate technical knowledge of many farmers as to efficient use of irrigation water. Various measures to correct these short comings are discussed briefly. As more and more flow is diverted to irrigation the Aral Sea will shrink. This will have disastrous effect on fishe-

ries and other industries presently located along the shore. The concensus is that this will be outweighed by the value derived from the eight million hectares of land that will be brought under irrigation. Climatological experts discount the threat of serious effects due to shrinkage or disappearance of the Aral Sea. (Crouse-Arizona)
W70-00705

SOIL AND WATER CONSERVATION DISTRICTS LAW.

SC Code Ann secs 63-51 thru 63-165 (Supp 1968).

Descriptors: *South Carolina, *Conservation, *Erosion control, Legislation, Soil conservation, Water conservation, *Demonstration farms, Demonstration watersheds, Land management, Contour farming, Soil management, Erosion, Farm management, Land development, Land use, Cover crops, Cultivation, Sediment control, Terracing, Water management, Water resources, Water resources development, Watershed management, Water utilization, Flood control, Fallowing.
Identifiers: Conservation districts.

A State Soil and Water Conservation Committee is composed of one supervisor from each of the state's five soil conservation districts, and its function is to coordinate and assist the supervisors of these districts. Provisions are made for the formation of new districts by petition of landowners to the Committee to hold a referendum. If approved by the referendum, application is filed with the Secretary of State who files and records the application. Similar procedures allow for including additional territory within existing districts, for subdividing districts, and for their discontinuance. Upon discontinuance, regulations made by the district are nullified, but the Committee is substituted as party to all contracts. Three supervisors are elected by the voters in each district for three-year terms and are removable for malfeasance only. Districts may conduct surveys, research, and demonstration projects in cooperation with other federal or state agencies; carry out preventive and control projects for soil and water; aid other agencies; and develop comprehensive plans for soil and water conservation. A board of adjustment is established to hear hardship petitions concerning land use regulations in each district. (Douberley-Florida)
W70-00736

ILLINOIS DRAINAGE CODE.
For primary bibliographic entry see Field 06E.
W70-00737

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

REMOVAL OF VEGETATION FROM WATERCOURSES.

Ind Ann Stat secs 11-1201 thru 11-1205.

Descriptors: *Indiana, *Vegetation, *Fresh water, *Conservation, Legislation, Plants, Drainage, Administrative agencies, Beaches, Boat-launching ramps, Permits, Land tenure, Weeds, Lakes, Streams, Rivers, Legal aspects, Regulation.
Identifiers: *Removal, Penalties (Criminal), Licenses.

No person, firm, or corporation shall take or remove any weeds, moss, or other water vegetation from any freshwater lake, stream, or river of this state unless such person, firm, or corporation has procured a license to do so. Such license shall be issued by the Division of Fish and Game of the Conservation Department. Any removal of water vegetation shall be done within regulations prescribed by the Division. The provisions of this act shall not apply to persons removing water vegetation to improve drainage, nor to any adjacent landowner who removes vegetation from the immediate vicinity of any boat landing or bathing beach. Violation of the provisions of this act shall be a misdemeanor. (Heckerling-Florida)
W70-00437

ENGINEERING PHASES OF LAND TREATMENT RELATED TO INCREASING WATER-USE EFFICIENCY AND STORAGE EFFICIENCY RAINFALL,
Nebraska Univ., Lincoln.
Howard D. Wittmuss.
Nebr Univ Water Resources Res Inst Proj Completion Rep, July 1969. 11 p, 1 fig, 1 tab. OWRR Proj No A-003-NEB.

Descriptors: *Land management, *Soil conservation, *Water conservation, *Terracing, Erosion control, Drainage, Mulching, Cover crops, Water storage, Soil temperature, Soil moisture, Electrical resistance.
Identifiers: Experimental watersheds.

Three systems of parallel steep backslope terraces were installed, field tested and evaluated as a new and improved soil and water conservation practice compatible with the operation of modern large scale, high speed farm machinery. A till-planter and system of mulch tillage were developed and used with the improved conservation systems. Runoff, soil loss and peak rate of runoff were reduced 1/3, 9/10 and 37/38 respectively, for the new conservation systems compared to a similar non-conservation watershed. Improvements in tile line design, in the size and arrangement of perforated openings in the terrace outlets, and in the method of sealing the terrace ridge to seepage of water along the tile line were recommended. A sediment sampler which would automatically collect a representative runoff sample was designed, constructed and field tested. A power series formula was developed for predicting changes in electrical resistance with changes in soil temperature. The electrical resistance blocks can be used to determine the soil moisture level in a soil over a wide range of temperatures. A theory and predication formula was developed for determining head pressure and friction losses for pipeline joints in tile. The potential evapotranspiration was determined for bromegrass under different levels of soil moisture stress for dryland conditions. (Knapp-USGS)
W70-00448

A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH VALIDITY TESTING OF A COMPARATIVE-PROJECTOR MODEL,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06A.
W70-00479

LEVEES.

Ind Ann Stat secs 27-810 thru 27-818 (1960).

Descriptors: *Indiana, *Levees, *Administrative agencies, Maintenance costs, Costs, Assessments, Weed control, Weeds, Washouts, Pumping, Legislation, Condemnation, Earthworks, Embankments, Maintenance, Repairing, Legislation, Administration.
Identifiers: Negligence, Penalties (Civil).

The committee placed in charge of a levee has full power to repair and maintain the same and may change the levee's location when necessary. Repair costs are generally assessed against the lands benefitted thereby; however, where such repairs are rendered necessary due to the negligence of a landowner or occupant, costs are assessed against his lands alone. The committee may fence levees and adopt measures to keep levees free from weeds. Upon petition by the landowners protected by a levee, the committee may make additions thereto. The committee may also, upon written request by the protected landowners, take all necessary steps to prevent the encroachment of any stream and the washing away of the stream banks. The committee may pump out or take necessary steps to remove water collected on lands protected by such levee. Land necessary for the maintenance of an authorized levee may be obtained by purchase or condemnation. It is unlawful to drive over or upon any levee. (Marsee-Florida)
W70-00485

PROPERTY RIGHTS OF RIPARIAN OWNER IN MISSOURI WITH RESPECT TO OBSTRUCTION OF A NATURAL OR ARTIFICIAL WATERCOURSE,
For primary bibliographic entry see Field 06E.
W70-00525

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 2 RIGHTS IN DEFINED WATERBODIES BASIC CONSIDERATIONS,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W70-00529

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 10 SINGLE PURPOSE AND MULTIPURPOSE WATER MANAGEMENT DISTRICTS,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W70-00537

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 13 A LOOK TO THE FUTURE,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 13, p 406-419, 1968.

Descriptors: *Florida, *Water conservation, *Administrative agencies, *Planning, Administration, Forecasting, Water allocation (Policy), Water resources development, Legal aspects, Federal government, State governments, Grants, Hydrologic cycle, Water pollution, Recreation, Research and development, Access routes, Consumptive use, Water utilization, Domestic water, Water pollution control.

The nation as a whole is in the early stages of a water crisis. Florida, however, has sufficient water resources to serve the needs of her citizens for at least the foreseeable future, provided that this resource is properly utilized. It is strongly recommended that a master plan for water resources development be formulated at once. Such a formulation requires adequate funds for research and a central state agency with authority to represent the state in all water use determinations. Planning must be based on hydrologic units with political considerations subordinated to scientific and aesthetic exigencies. Pollution abatement programs must be implemented at once. Planning for state acquisition and development of shoreline should be a part of any long-range water use program in Florida. Legal doctrines must be formulated which will secure to the public at large access rights in privately owned navigable waters. There is a need for legislation to regulate consumptive uses of water and to create hydrologically sound water management districts. Finally, investigations should be made concerning the feasibility of water movement from North Florida to the population centers of South Florida. (See W70-00527). (Wheeler-Florida)

W70-00540

INTERFERENCE WITH THE PUBLIC RIGHT OF NAVIGATION AND THE RIPARIAN OWNER'S CLAIM OF PRIVILEGE,
For primary bibliographic entry see Field 06E.
W70-00546

REAL PROPERTY--EASEMENTS--CONSTRUCTION OF INSTRUMENT GRANTING RIGHT OF FLOWAGE,
George A. Kronenberg.
Ala L Rev, Vol 14, No 2, p 463-470, Spring 1962. 8 p.

Descriptors: *Alabama, *Boundaries (Property), *Water rights, *Riparian rights, Legal aspects, Judicial decisions, Dam construction, Dams, Overflow, Lakes, Drainage, Easements, Fishing, Contracts, Navigable waters, Streams, Boating, Swimming, Recreation, Natural streams, Water law, Impounded waters, Ownership of beds, Water utilization, Non-navigable waters, Preferences (Water rights).
Identifiers: *Easements of flowage, Easements appurtenant, Easements in gross, Water privileges.

In Hill v Davis, 130 So 2d 39 (Ala 1961), the plaintiff dammed a branch on his property and obtained an easement of flowage from the defendant. Litigation ensued when the defendant built a fence along his boundary while the lake was temporarily drained. The appellate court held that the interpretation placed upon contracts by the parties and practiced by them will be accepted by the court, and that the right to take fish in any water which is not navigable follows the ownership of the water, if that is separated from the ownership of the soil. Since the lake had been used by the plaintiff as a commercial fishing lake for thirty years prior to the time when the defendant built his fence, the court found that the parties had interpreted the easement of flowage as including fishing rights. After the law of easements is considered, it is concluded that what was here granted was an easement appurtenant. An analysis of cases leads to the conclusion that in interpreting clear and unambiguous grants the weight of authority is to the effect that rights of boating and fishing are not incidental to an easement of flowage and must be specified in the grant; it is noted that the court could have reached the same result on the basis of prescriptive use. (Keith-Florida)
W70-00548

FEDERAL ENCROACHMENT ON STATE WATER RIGHTS,
For primary bibliographic entry see Field 06E.
W70-00549

THE NAVIGATION SERVITUDE AND JUST COMPENSATION--STRUGGLE FOR A DOCTRINE,
Richard W. Bartke.
Oregon L Rev, Vol 48, No 1, p 1-44, Dec 1968. 44 p, 194 ref.

Descriptors: *Condemnation, *Eminent domain, *Navigable waters, *Federal government, Condemnation value, Right-of-way, Water rights, Easements, Legal aspects, Cost repayment, Compensation, Local governments, State governments, Federal Power Act, Federal-state water rights conflicts, Navigation, Administrative agencies, Admiralty, Federal jurisdiction, United States.
Identifiers: *Navigation servitude, Commerce power.

The federal interest in navigable waters or 'navigation servitude' is a proprietary one. The development of the concept of navigation servitude is traced from early holdings of the Supreme Court on the commerce power and admiralty jurisdiction granted the federal government in the Constitution. Past and present attitudes of the courts in awarding compensation for condemned lands adjoining navigable waters is examined. The most recent court decisions indicate that compensation will be based upon the government's interest in the flow of the stream in question, not the type of improvement or special adaptability of the land involved. Condemnation by local and state governments and private bodies holding licenses from the Federal Power Commission is also discussed. In these proceedings the licensees should be treated as is the United States in regard to compensation awards and collection of charges for use of assets in the public domain. The author urges development of a comprehensive doctrine, based upon the proprietary nature of navigation servitude, to replace the case by case approach used thus far in solving these water rights problems. (Kelly-Florida)
W70-00559

REAL PROPERTY: DISPOSITION OF DIFFUSED SURFACE WATERS IN NORTH CAROLINA,
William P. Aycock.
NC L Rev, Vol 47, No 1, p 205-218, Dec 1968. 14 p, 81 ref.

Descriptors: *North Carolina, *Surface waters, *Surface runoff, *Riddance (Legal aspects), Surface drainage, Repulsion (Legal aspects), Judicial decisions, OBSTRUCTION TO FLOW, Alteration of flow, Diversion, Natural flow doctrine, Reasonable use, Relative rights, Streamflow, Watercourses (Legal), Natural streams, Drainage.
Identifiers: Civil law, Common enemy rule.

Surface water is defined as that water derived from precipitation or from springs, which is diffused over the surface of the ground. It is distinguished from water flowing into a natural watercourse or forming an identifiable water body. Three basic rules have developed in various jurisdictions concerning disposal of surface waters by landowners. These are: (1) the civil law rule, which requires continuation of natural drainage conditions through imposition of servitudes on lower landowners; (2) the common enemy rule, which permits a landowner to obstruct surface flow without liability; and (3) the reasonable use rule, which imposes liability only for unreasonable alteration of flow. North Carolina early adopted the civil law rule regarding surface water disposal. An analysis of cases reveals some modification of that rule to permit artificial drainage into a natural watercourse, even where acceleration and increase in flow occur. In view of the current trend toward industrialization and urbanization, the author predicts further modification by North Carolina courts to meet future problems. (Kelly-Florida)
W70-00561

THE APPROPRIATION OF PROPERTY FOR LEVEES: A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
Richard P. Wolfe.
Tul L Rev, Vol 40, No 2, p 233-288, Feb 1966. 56 p, 223 ref.

Descriptors: *Louisiana, *Condemnation, *Condemnation value, *Levees, Compensation, Right-of-way, Easements, Eminent domain, Judicial decisions, Legal aspects, Land tenure, Land appraisal, Land use, Flood control, Flood protection, Dikes, State jurisdiction, Federal government, Mississippi River, Public rights, Boundaries (Property), Riparian rights, Navigable rivers.

Governmental authorities in Louisiana have experimented with different methods of obtaining lands for levee construction and of financing levee systems. After surveying the historical development of Louisiana's levee systems, the author concludes that the scope of levee construction has so increased that the traditional method of taking lands is no longer justifiable. The doctrine of appropriation under riparian servitude is grounded in civil law concepts inherited by Louisiana from France and Spain. The author related the doctrine to the state's exercise of its police power by which land is taken for the public welfare without compensation. The courts have rationalized appropriation both as an exercise of police power and as an application of the reserved-right theory (by which the state retains a servitude in all riparian land grants). The author notes the inadequacy of the compensation that may be given, discusses the unclear status of the appropriated land and the broadness of the power to appropriate, and questions the constitutionality of the appropriation doctrine. (Kelly-Florida)
W70-00562

THE APPROPRIATION OF PROPERTY FOR LEVEES: A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
Richard P. Wolfe.
Tul L Rev, Vol 40, No 2, p 233-254, Feb 1966. 56 p, 223 ref.

Descriptors: *Louisiana, *Condemnation, *Compensation, *Levees, Flood control, Mississippi River, Administration, Maintenance, Planning, State jurisdiction, Federal government, Public health, Public benefits, Flood protection, Land tenure, Land use, Riparian rights, Riparian land, Severance, Legal aspects, Banks, Public rights.

Examination of the historical development of financing and planning levees in Louisiana reveals that originally private riparian landowners were responsible for maintaining levees on their lands. Levee districts were later established and continue to administer the levee system, subject to technical advice from state or federal engineers. The districts appropriate land or levee sites without payment of just compensation under the doctrine of appropriation under riparian servitude. Other states take land for these purposes via eminent domain, but Louisiana traditionally has held that construction of levees on private property is a regulation of the owner's use of the land in the interest of public safety, not a use of the owner's land for the public. The appropriation doctrine is further justified under the reserved-right theory. At common law beds of tidewater rivers are owned by the sovereign. Under the civil law of France and Spain, however, rivers belong to all men in common, and the banks, though owned by riparian landowners, were subject to public use or servitude. Louisiana adheres basically to the civil law rule, limiting its application to navigable rivers and to flood control. (Kelly-Florida)
W70-00563

THE APPROPRIATION OF PROPERTY FOR LEVEES: A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
Richard P. Wolfe.
Tul L Rev, Vol 40, No 2, p 255-288, Feb 1966. 56 p, 223 ref.

Descriptors: *Louisiana, *Levees, *Condemnation, *Compensation, Land tenure, Eminent domain, Easements, Condemnation value, Land appraisal, Riparian land, Riparian rights, Ownership of beds, State governments, State jurisdiction, Civil law, Flood control, Navigable rivers, Reasonable use, Relative rights, Appropriation, Sites, Beds.
Identifiers: *Retained-right theory, Constitutional law, Civil law.

Using either police power or the reserved-right theory as justification, the appropriation doctrine permits taking of land for levee sites with no compensation. Statutes permit compensation for the assessed value of the land, but the author contends that compensation must be for fair market value to be constitutionally just. The status of land taken is unclear under Louisiana case law. There is some question as to whether land located on the river side of a levee is part of the bed unless it is inundated. Title to land not part of the bed is retained by the original owner. The scope of the power to take beyond adjoining riparian lands has been extended to include all land reasonably necessary in

the situation. The land taken must be used solely for flood control on the adjoining river. The constitutionality of the appropriation doctrine is questioned when it is based upon the retained-right theory due to the lack of title chain from the state to much private land, inclusion of land not directly adjoining a river, inadequate compensation for improvements, and lack of judicial review. (Kelly-Florida)
W70-00564

COMPENSATION FOR THE RIGHT OF ACCESS TO NAVIGABLE WATERS,
Leighton S. Houck.
Wash and Lee L Rev, Vol 26, No 1, p 136-143, Spring 1968. 8 p, 29 ref.

Descriptors: *Kentucky, *Riparian rights, *Riparian land, *Access routes, Right-of-way, Condemnation, Eminent domain, Judicial decisions, Navigable waters, Legal aspects, Water law, Compensation, Condemnation value, Governments, Public benefits, Public rights, Shores, Coastal structures, Damages.

According to a recent Court of Appeals of Kentucky decision, riparian landowners have the right of a reasonable access to the entire body of water on which their land borders. Such a right has value, and before the state may take or impair such right, it must pay the owner just compensation therefor. There is universal agreement among both state and federal courts that a riparian landowner must be compensated for any actual physical encroachment by the government. These courts, however, do not agree as to whether there should be recognized any right of access at all, even ingress and egress, as a valuable property right and, if so recognized, the extent of that right. Jurisdictions which do recognize the right of access as a valuable property right nevertheless deny compensation if the governmental action is for the purpose of improving navigation. Rather than utilizing rigid doctrinaire concepts, the court looked first at the individual's investment in the land and then weighed this interest against the demands of commerce. Thus, by applying a test of fairness, the fact that a proper governmental function is being performed will no longer by itself be a basis for denying compensation. (Schram-Florida)
W70-00566

THE RIGHT OF ACCESS TO NAVIGABLE WATERS--COMPENSABILITY UNDER EMINENT DOMAIN,
Thomas C. Spencer.
Wash and Lee L Rev, Vol 25, No 2, p 323-328, Fall 1968. 6 p, 22 ref.

Descriptors: *Access routes, *Riparian rights, *Compensation, *Eminent domain, Public benefits, Riparian land, Navigable waters, Condemnation value, Damages, Water law, Judicial decisions, Legal aspects, Governments, State governments, Condemnation, Navigation, Federal government, History.

The federal rule governing compensation for taking a riparian landowner's access to navigable waters for a public use is that no compensation need be given if there is no physical encroachment upon or taking of land and if the governmental act is to improve navigation. This has been extended to make the federal government immune from making compensation for nearly any act so long as there is no physical encroachment upon the land. A majority of the states follows the rule that if the work is not to aid navigation, the riparian landowner may recover for any right lost or damaged. Rather than expanding the navigational servitude immunity, however, some of these states have said that the right of access is a general right held by the public which can be taken for the good of the public in general. A minority of states find that there can be no private rights in the public domain and therefore, no compensation is ever necessary. The right of access to navigable waters is a public right held in trust by the state. Thus, either as a rule or through interpretations, the tendency today is towards not compensating riparian owners. This is justified by recognizing that if compensation were required, the cost of public improvements would be prohibitive, and commerce would be considerably impeded. (Schram-Florida)
W70-00567

WATER--AS A SPECIES OF PRIVATE PROPERTY--THE ILLINOIS VIEW,
John E. Cribbet.
Ill B J, Vol 47, No 5, p 449-477, Jan 1959. 29 p, 77 ref.

Descriptors: *Illinois, *Riparian rights, *Usufructuary right, *Water rights, Prior appropriation, Water law, Natural flow doctrine, Natural flow, Water pollution, Consumptive use, Alteration of flow, Navigable waters, Prescriptive rights, Reasonable use, Navigation, Drainage.
Identifiers: Property rights.

Whether water is a property right is a question answerable only after an understanding of differing water laws. Western states use agencies to supervise a prior appropriation system of vested water rights based on an appropriation of water by the earliest user. Illinois follows the common-law riparian doctrine of water rights wherein riparian owners along watercourses have a usufruct in water as it passes their land. This right of use is protected as a vested property right subject to a public easement for navigation. Riparians have equal rights to use the passing water, but use by one riparian cannot deprive others of an equal opportunity to the water. Riparian rights are based on the natural flow doctrine of watercourses and modified in cases of pollution and consumption to reasonable use test. Illinois follows the Roman Law of natural drainage, modified and augmented by a comprehensive Drainage Code. Recent legislation establishing water study and control boards reveals Illinois' concern with its water problems. (McDonough-Florida)
W70-00568

CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.

La L Rev, Vol 14, No 1, p 267-273, Dec 1953. 7 p, 27 ref.

Descriptors: *Louisiana, *Navigable waters, *Ownership of beds, *Public rights, Lakes, Beds under water, Judicial decisions, Legislation, Land tenure, State governments, Patents, Civil law.
Identifiers: Private rights.

Since 1812, beds of navigable waters have been regarded as belonging to the state as public lands. Public lands were traditionally classed as either susceptible or insusceptible of private ownership, with navigable stream or lake beds being insusceptible of such ownership. The legislature has consistently excluded beds of navigable waters in legislation authorizing disposition of public lands. The judiciary announced its adherence to the insusceptibility view in the landmark case of Miami Corporation v State, 186 La 784, 173 So 315 (1936), based on principles of public policy. Yet, in Humble Oil Company v State Mineral Board, 223 La 47, 64 So 2d 839 (1953), the court did not even acknowledge this principle of insusceptibility. The court did not consider the state's contention that the conveyance of the tract of land which included a navigable lake could not have passed title to the bed of the lake since not authorized by statute. The court merely relied on Act 62 of 1912, which placed a 6 year limitation on suits by the state to annul patents. In so doing, the court applied the act to the transaction in question without inquiry into the statutory authority of the patent alienating the public land. In view of the conflicting decisions, a re-examination of the Humble Oil decision in future cases seems warranted. (Harris-Florida)
W70-00569

WATER BOUNDARIES,
Fred K. Read.
Ky State B J, Vol 8, No 4, p 10-12, Sept 1944. 3 p.

Descriptors: *Kentucky, *Ohio River, *Riparian rights, *Boundaries (Property), Accretion (Legal aspects), Avulsion, Bank erosion, High water mark, Low water mark, Legal aspects, Ownership of beds, Navigable waters, Non-navigable waters, Tidal waters, Judicial decisions, Legislation, Cities, Banks, Beds, Riparian land.
Identifiers: *Common law.

Under English common law, the beds and shores of all tidal waters were owned by the crown. All other lands beside and under the waters were susceptible of private ownership, regardless of the navigability of the waters. Although most states differ, Kentucky allows the title to the banks and beds of all rivers and streams, regardless of navigability, to vest in the abutting property owner. This is subject only to the public easement in navigation. A riparian landowner owns to the center of the stream and is entitled to any accretions by avulsion or reliction, and must accept any loss due to erosion or dereliction. In the case of the Ohio River, even though Kentucky's ownership extends to the far bank, riparian owners in Kentucky still own only to the center line. This rule also applies to municipalities, except for third-class cities who, by statute, had their boundaries extended to the low water mark of the opposite shore. (Schram-Florida)
W70-00570

DETERMINATION OF RIGHTS TO REAL PROPERTY ALONG THE MISSOURI RIVER IN CONNECTION WITH RIVER STABILIZATION,
Robert M. Underhill.
Iowa L Rev, Vol 42, No 1, p 58-62, Fall 1956. 5 p, 28 ref.

Descriptors: *Iowa, *Missouri River, *Accretion (Legal aspects), *Boundaries (Property), Avulsion, Stabilization, Judicial decisions, Legislation, Interstate compacts, Riparian rights, Legal aspects, Ownership of beds, Riparian land, Water law, High-water mark, Stream stabilization, Channels, Meanders, Sand bars, Islands, Federal government.

Stabilization of the Missouri River channel by the United States Corps of Engineers will cause many legal problems. Questions will arise relative to the western boundary of Iowa, and pertaining to private titles to lands which hitherto were accretions, islands, or submerged lands beneath the Missouri River. A solution to the Iowa boundary problem has been accomplished by an agreement between executive authorities of Iowa and Nebraska. This, together with reciprocal legislative enactments, seemingly settle the western boundary of Iowa along the stabilized channel of the Missouri River. Riparian owners of land along the banks of a navigable stream hold title to accretions to their lands to the high-water mark of the stream. Land suddenly annexed to the state's domain through avulsion, however, is not susceptible to riparian ownership. When such avulsion creates sandbars and islands, conflicts between riparian owners and Iowa will arise. Because a substantial amount of land will be added to Iowa by reason of the channel stabilization, claims of private individuals based upon adverse possession and the doctrine of prescription will be made. An additional area of controversy will be the apportionment of frontages among the riparian owners along the new river course. (Schram-Florida)
W70-00572

LITTORAL RIGHTS ON THE GREAT LAKES,
For primary bibliographic entry see Field 06E.
W70-00574

REAL PROPERTY--WATER RIGHTS--PUBLIC RIGHTS OF FISHING AND NAVIGATION OVER FLOODED LANDS.
Vand L Rev, Vol 5, No 3, p 669-671, Apr 1952. 3 p, 21 ref.

Descriptors: *Fishing, *Floodwaters, *Relative rights, *Land tenure, Water rights, Real property, Navigable waters, Navigation, Flooding, Legal aspects, Riparian rights, Riparian land, Boating, Hunting, Public rights, Land, Sport fishing, Ownership of beds, Recreation, Usufructuary right, Avulsion, Tidal waters.
Identifiers: Submerged lands.

In Bohn v Albertson, 238 P2d 128 (Calif App 1951), the lessees of a flooded tract of land sought to enjoin the public from fishing thereon. The court held that the public had the right to fish and boat. Once title to land is acquired, it is not affected when the property becomes submerged under navigable waters by avulsion. Although the landowner may drain and reclaim the land, the public has an easement of navigation in such waters. The fact that at common law the public right of fishing was coextensive with the right of navigation in state-owned, tidal waters has led some American jurisdictions to disregard the separate nature of these rights. These jurisdictions have extended the fishing right to all navigable waters, regardless of who owns the stream bed. However, the majority of courts hold that the right to fish and hunt is an incident of land ownership, exclusive in the riparian owner. Where private land is inundated, cases have unanimously allowed the owner the private right of fishing. The view of the instant case is, however, consistent with the public nature of inland fishing. (Marsee-Florida)
W70-00575

THE MOVEMENT FOR NEW WATER RIGHTS LAWS IN THE TENNESSEE VALLEY STATES,
For primary bibliographic entry see Field 06E.
W70-00577

WATER NAVIGATION REGULATIONS.
For primary bibliographic entry see Field 06E.
W70-00587

PROVISIONS AS TO DITCHES, DRAINAGE, AND RECLAMATION.

Ky Rev Stat Ann secs 269.210-269.270 (1963).

Descriptors: *Kentucky, *Drainage districts, *Drainage programs, *Local governments, Legal aspects, Construction, Maintenance, Eminent domain, Condemnation, Costs, Taxes, Assessments, Legislation, Inspection, Construction costs, Cities, Obstruction to flow.

Any drainage corporation may extend or construct additional ditches to facilitate drainage and may use the power of eminent domain to condemn needed lands. Upon petition of the corporation and after hearing, the county court may order the extension by the corporation. The landowner in any county of 25,000, through whose land a non-navigable stream has its natural outlet or a ditch or drain has been constructed, must keep the same free from obstructions. The county engineer shall inspect such streams and ditches and notify the owner of any obstructions. If the owner fails to remove said obstructions, the engineer shall cause them to be removed and the cost will become a lien upon the land. Any person, upon approval of the drainage board, may petition the county court to be removed from a drainage district. The county court for any county may establish a county-wide surface water drainage district to be paid for by county taxes and may acquire all necessary rights-of-way by purchase or condemnation. (Darragh-Florida)
W70-00590

DRAINAGE MAINTENANCE AND REPAIR DISTRICTS.
Ind Ann Stat secs 27-243 thru 27-250 (1960).

Descriptors: *Indiana, *Drainage districts, *Ditches, *Administrative agencies, Assessments, Maintenance costs, Governments, Legislation, Legal aspects, Adjudication procedure, Construction costs, Drainage, Financing, Administration, Maintenance, Repairing, Drainage systems.

Where a public ditch or drain has been or shall be constructed pursuant to the order of any circuit or superior court or board of county commissioners, the owners of assessed real estate, who would benefit by the construction of such drain or ditch, may file a petition with the circuit or superior court in their county seeking the establishment of a Drainage Maintenance and Repair District. When such proposed district includes a city or town, the common council or town board of the city or town may sign the petition on behalf of landowners within that city or town. After a hearing and opportunity for contest by landowners within the proposed district, the court may establish such proposed district. Commissioners appointed by the court must maintain such ditch or drain in proper condition and are authorized to hire all labor and purchase all material necessary therefor. Lands benefited by such maintenance are assessed in advance for the costs thereof. Upon petition by landowners, any maintenance district under this act may be dissolved by the court which established it. (Marsee-Florida)
W70-00594

DRAINS: RIGHT-OF-WAYS--OBSTRUCTIONS--CROSSINGS--CONNECTIONS.
Ind Ann Stat secs 27-2301 thru 27-2310 (Supp 1968).

Descriptors: *Indiana, *Administrative agencies, *Obstruction to flow, *Easements, Drainage, Drainage systems, Drains, Ditches, Planning, Right-of-way, Construction, Maintenance, Relocation, Levees, Bridges, Culverts, Legislation, Public utilities, Bridge construction, Highways, Railroads.

Authorized personnel from the county drainage board have a right of entry over and upon lands lying within 75 feet of any legal drain. Unless approved by the county drainage board in the county in which the drain lies, objects, crops, and trees along the easement run the risk of removal or damage. Obstructions are to be removed from drains and any needed repairs made immediately either by the landowner causing the obstruction or by the board. The cost of repairs made by the board may be assessed against a landowner causing the harm. Pipeline companies, public utilities, or other persons may be required, by suit if necessary, to relocate their equipment or repair damages caused by them to any legal drain. Proposed drains within 300 feet of any levee must be approved by the Indiana Flood Control and Water Commission. Plans may be made for the construction of culverts or bridges or the improvement of existing ones where drains will cross public highways or railroad right-of-ways. The construction of drains shall not prevent owner ingress or egress to his land via proper crossings. The connection of private drains with legal drains must be approved by the Stream Pollution Board. (McDonough-Florida)
W70-00595

INDIANA DEEP WATERWAYS COMMISSION.
Ind Ann Stat sec 68-201 (1961).

Descriptors: *Administrative agencies, *Indiana, *Great Lakes, *Atlantic Ocean, Canals, Federal government, St. Lawrence River, St. Lawrence Seaway, Legislation, Legal aspects, Projects, Project planning.

The Indiana Deep Waterways Commission is created, consisting of three members who are appointed by the governor. The purposes of the Commission are: (1) to investigate the subject of connecting the Great Lakes with the Atlantic Ocean via the Welland Canal and the St. Lawrence River; (2) to cooperate with other bodies and commissions created for that purpose; and (3) to urge upon Congress the enactment of legislation to promote such purpose. (Keith-Florida)
W70-00596

THE PROPOSED SOLWAY FIRTH BARRAGES: A REVIEW OF THE GEOLOGICAL AND GEOTECHNICAL ASPECTS,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia).
J. A. Kay.
Eng Geology, Vol 3, No 4, p 265-306, Oct 1969. 42 p, 12 fig, 8 tab, 64 ref.

Descriptors: *Dams, *Water supply, *Estuaries, Hydrologic data, Geology, Hydrogeology, Stratigraphy, Engineering geology.
Identifiers: England, Solway, Firth.

Barrages are proposed to create freshwater lakes in Solway Firth, England. The specific geology of each of the proposed sites is reviewed and the inadequacy of present information emphasized. Geotechnical problems which might arise during and after construction of the barrages are summarized. The possible sources of various types of constructional materials are indicated. Finally, methods are suggested which would provide much of the information essential for an accurate assessment of the various proposals for the area. (Knapp-USGS)
W70-00646

DETERMINATION OF DEPENDENCE BETWEEN FILTRATION CHARACTERISTICS OF DRAINAGE CANALS (IN RUSSIAN),
Akademiya Nauk Gruzinskoi SSR, Tiflis.
S. V. Meunargiya.
Published in Russian with English and Georgian summaries. Soobshch Akad Nauk, Gruz SSR, Vol 54, No 1, p 157-160, Apr 1969. 4 p, 5 fig, 1 tab, 3 ref.

Descriptors: *Drainage engineering, *Canal seepage, *Canals, *Filtration, Drainage water, Model studies, Water loss, Discharge (Water), Electrical studies, Parametric hydrology, Mathematical models.
Identifiers: *USSR, Georgia, SSR, Drainage canal characteristics.

The filtration characteristics of drainage canals were investigated with experimental models using the principles of electrical engineering and a mathematical formula. Several graphs giving the main filtration parameters of drainage canals can be readily obtained by using electromodeling methods, and can be successfully applied for the evaluation of actual filtration parameters of drainage canals. (Gabriel-USGS)
W70-00663

APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
Central Creil Exploitation Service (France); and Departments of Tests and Thermal Studies (France).
J. Chaleil, and H. Procaccia.
L'Eau, No 7-8, p 327-336, July-Aug 1969. 10 p, 9 fig, 2 tab.

Descriptors: *Water temperature, *Water yield, *Instrumentation, *Mathematical studies, *Pumping, *Thermodynamics, Electrical equipment, Pressure, Energy, Energy transfer.
Identifiers: Pump discharge.

This article develops the application of the principles of thermodynamics for the evaluation of water-pump discharges and gives a detailed

description of the instruments used for measuring water temperature. Discharge data obtained by using the thermodynamic methods are compared with those from classical methods. The final data obtained by these two methods are not identical. (Gabriel-USGS)
W70-00679

RIVER AND HARBOR IMPROVEMENTS.

33 USCA secs 558C, 565, 567B (1957).

Descriptors: *United States, *Rivers and Harbors Act, *Easements, *Interstate compacts, Navigable rivers, Right-of-way, Federal government, State governments, Flood control, Pollution abatement, Administrative agencies, Legislation, Legal aspects, Tennessee Valley Authority Project.
Identifiers: Secretary of the Army.

The Secretary of the Army is authorized to grant easements for rights-of-way across lands acquired by the United States for river, harbor, and flood control improvements, provided that such rights-of-way shall be granted only upon the Secretary's finding that the same will be in the public interest and will not substantially injure the interest of the United States. Such rights-of-way may be annulled by the Secretary for failure to comply with the terms of the grant. The Secretary's authority does not extend to lands held by the Tennessee Valley Authority. Any persons or corporations may improve, at their expense, any navigable river upon the approval of plans therefor by the Secretary and by the Chief of Engineers of the Army. Such plan must conform with the general plan of the government improvements and must not impede navigation. Congressional consent is given to Maryland, West Virginia, Virginia, Pennsylvania, and the District of Columbia to form a compact to create a Potomac Valley Conservancy District and to establish an Interstate Commission on the Potomac River Basin. No right or jurisdiction of the United States in this area is to be affected thereby. (Carruthers-Florida)
W70-00696

IRRIGATION IN THE AMU-DAR'YA BASIN: PROGRESS REPORT,
For primary bibliographic entry see Field 03F.
W70-00705

DRAINAGE DISTRICTS UNDER 1911 ACT.

SC Code Ann secs 18-291 thru 18-303, 18-311 thru 18-323 (1962).

Descriptors: *South Carolina, *Drainage districts, *Financing, *Administrative agencies, State governments, Local governments, Federal government, Legal aspects, Legislation, Costs, Government finance, Governments, Assessments, Evaluation, Taxes, Value, Cost allocation, Cost sharing, Bonding.

Land is classified and assessed according to the degree by which it is benefitted by the proposed improvements. Total assessments exceeding twenty-five cents per acre are financed by bond issue after appropriate notice to landowners within the district and expiration of a period during which they may contest the issue. The drainage districts cooperate with the United States Government and may turn drainage work over to the latter on occasion. (Johnson-Florida)
W70-00715

CONOBRE V FRITSCH (NATURAL WATERCOURSES).
111 NE2d 38-41 (Ct App Ohio 1952).

Descriptors: *Ohio, *Watercourses (Legal), *Closed conduit flow, *Obstruction to flow, Spring waters, Judicial decisions, Streamflow, Pipes, Tiles, Swimming pools, Subsurface waters, Underground, Water sources, Channel flow, Channels, Farms, Farm ponds, Diversion, Pipe flow, Natural flow, Overland flow, Subsurface flow.

Plaintiffs sought to enjoin the owners of a farm, on which a stream originated from an underground spring, from obstructing, diverting, or diminishing the flow of water from the stream on the ground that the stream was a natural watercourse. The plaintiff owned a commercial swimming pool which utilized water from the stream. The issue was whether such spring and its consequent overflow into a channel, even though for a great part of its distance encased in tile pipe, created a natural watercourse. The court held that such spring and stream did constitute a natural watercourse and that the parties had only such rights as are given to riparian owners. The court noted that the stream, encased in the tile pipe, had run in the same direction for more than fifty years. 'Watercourse' was defined as a stream, usually flowing in a particular direction in a definite channel, having a bed, banks, or sides and discharging into some other stream or body of water. The injunction was granted. (Marsee-Florida)
W70-00720

SOIL AND WATER CONSERVATION DISTRICTS LAW.
For primary bibliographic entry see Field 03F.
W70-00736

ILLINOIS DRAINAGE CODE.
For primary bibliographic entry see Field 06E.
W70-00737

WEST CENTRAL MISSISSIPPI WATERWAY COMMISSION.
For primary bibliographic entry see Field 06E.
W70-00738

DRAINAGE DISTRICTS UNDER 1911 ACT: ORGANIZATION, POWERS AND EMPLOYEES OF COMMISSION; FEES, ETC.
SC Code Ann secs 18-251 thru 18-258 (1962).

Descriptors: *South Carolina, *Administrative agencies, *Drainage districts, *State governments, Governments, Legislation, Legal aspects, Local governments, Financing, Costs, Government finance, Administrative costs.
Identifiers: Levee districts.

After a drainage district is established, the clerk of the court appoints three members to the Board of Drainage Commissioners from the top three candidates for the post in an election within the local drainage or levee district. The Board shall possess those powers usually possessed by a corporation, including the right to hold and convey property and to sue and be sued. (Johnson-Florida)
W70-00759

LAWS OF FLORIDA GOVERNING WATER USE,
For primary bibliographic entry see Field 06D.
W70-00769

NORTH CAROLINA AND OTHER ATLANTIC STATES,
For primary bibliographic entry see Field 06E.
W70-00770

RIGHTS OF WAY FOR DRAINAGE.

SC Code Ann secs 18-51 thru 18-58 (1962).

Descriptors: *South Carolina, *Drainage, *Ditches, *Surface drainage, Damages, Legal aspects, Surface waters, Drainage practices, Drainage systems, Water control, Surface runoff, Legislation, Land development, Land management, Land use, Distribution systems, Excavation, Compensation, Construction, Adjudication procedure.

Any person who owns lands which can only be drained over the land of another is allowed under certain circumstances to enter the property of such owner and construct or cut such waterway as is necessary for this purpose. Provisions are included to deal with objections of the adjacent landowner to such construction. Each landowner selects a referee to represent his interests in the dispute. The two referees so appointed will select a third, and the three of them will have authority to fix the location and just compensation for such waterway by a written verdict. Appeal from their decision lies in magistrates' courts. Right to open and repair such waterway commences immediately upon payment of the compensation thus ascertained. Failure of the adjacent owner to appoint a referee allows the referee appointed by the person seeking to construct the waterway to proceed by himself as if all three were meeting. (Johnson-Florida)
W70-00775

THE WANDERING MISSOURI RIVER: A STUDY IN ACCRETION LAW,
For primary bibliographic entry see Field 06E.
W70-00777

THE WANDERING MISSOURI RIVER: A STUDY IN ACCRETION LAW,
For primary bibliographic entry see Field 06E.
W70-00778

THE WANDERING MISSOURI RIVER: A STUDY IN ACCRETION LAW,
For primary bibliographic entry see Field 06E.
W70-00779

COMPENSATION FOR TAKING OF FLOWAGE EASEMENTS BY CONDEMNATION,
Robert Corontzos.
Mont L Rev, Vol 23, No 2, p 212-221, Spring 1962. 10 p, 78 ref.

Descriptors: *Easements, *United States, *Compensation, *Condemnation, Judicial decisions, Legal aspects, Eminent domain, Federal government, Land use, Real property, Dams, Property values, Adjudication procedure.
Identifiers: *Flowage easements.

The case of United States v Virginia Electric and Power Company, 365 U S 624 (1961), dramatically presented the problem of determining whether or not flowage easements are 'private property', the taking of which requires just compensation. However, in the instant case, the court did not discuss the problem as involving any question of whether or not 'property' as such was present, but rather based its discussion solely on considerations of 'valuation'. Courts have been asked on numerous occasions to define 'property' under particular fact situations. Under the fifth amendment, 'property' has been held to be a group of rights inhering in a citizen's relations with others which results in certain powers over a physical thing. Whether there is a taking must be determined in light of the particular facts and circumstances involved. A private easement has generally been held to be 'property' in the constitutional sense. The holder must have a real interest in the property. Qualified rights must be considered in light of the qualifying conditions under which they exist. A careful reappraisal of the problems involved in this area should be undertaken by the judiciary. (Heckerling-Florida)
W70-00781

INTERSTATE COOPERATION IN RIVER BASIN DEVELOPMENT,
For primary bibliographic entry see Field 06B.
W70-00784

PUBLIC RIGHT AND THE RULE OF NO COMPENSATION,
Robert R. Rossi.
Notre Dame Lawyer, Vol 44, No 2, p 236-251, Dec 1968. 16 p, 112 ref.

Descriptors: *Compensation, *Navigation, *Riparian rights, *Eminent domain, Riparian waters, Water rights, Navigable waters, Obstruction to flow, Reasonable use, Water law, Navigable rivers, Bridges, Dams, Damages, Federal government, State governments, Judicial decisions, Legal aspects.
Identifiers: *Navigation servitude.

Riparian owners are injured when downstream obstacles, constructed with legislative authorization, cutoff their navigation rights. Historically, riparians have had the rights of access to the adjacent navigable waters and of navigation. Present case law denies the riparian normal eminent domain compensation for interference with these rights by characterizing 'access' as a compensable private right and 'navigation' as a non-compensable public right. Although liberalizing influences have attempted to construe obstructions to access to navigable waters as compensable, courts are reluctant to find a constitutional 'taking' unless the obstruction causes damages to the riparian different in kind and degree than that sustained by the general public. Further, the concept of the navigation servitude permits the taking of private property (access) without compensation in exercise of the navigation power. This rule is followed by state and federal governments in the construction of bridges and dams in aid of navigation. Critics of this rule analogize the stranded riparian's situation with that resulting from a highway access taking. Yet compensation is allowed for the latter. Federal and state legislation allowing compensation seems the only viable solution for the injured riparian owner. (McDonough-Florida)
W70-00785

COMMISSIONERS OF HEALTH AND DRAINAGE IN CERTAIN COUNTIES.

SC Code Ann secs 18-71 thru 18-76 (1962).

Descriptors: *South Carolina, *Drainage, *Administrative agencies, *Local governments, Ditches, Damages, Legal aspects, Surface drainage, Surface waters, Drainage practices, Legislation, Water control, Drainage systems, Water pollution, Water pollution control, Relation, Estimated costs, Assessments, Compensation, Public health.

The governing bodies of enumerated counties may act as commissioners of health and drainage. Such commissioners hear arguments and decide upon just compensation in disputes where a landowner desires to drain his land by cutting a necessary outlet through adjoining lands. When a third of the landowners upon a watercourse desire to drain their lands into such watercourse, the commissioners have authority to let contracts for accomplishment of this purpose and levy assessments apportioned according to the amount of benefit received by each landowner. If a watercourse is deemed unsanitary and a hazard to public health, the commissioners may proceed to drain the watercourse after receiving estimates of the cost. If the expense involved is greater than a reasonable assessment to the landowners, the commissioners may petition the judge of the circuit court and upon his approval pay the excess costs from the county revenue. (Johnson-Florida)
W70-00788

RIPARIAN RIGHTS IN ARTIFICIAL LAKES AND STREAMS,
Alvin E. Evans.
Mo L Rev, Vol 16, No 2, p 93-117, Apr 1951. 25 p, 99 ref.

Descriptors: *Missouri, *Riparian rights, *Artificial watercourses, *Judicial decisions, Streams, Lakes, Dams, Prescriptive rights, Boating, Channels, Beds, Fishing, Recreation, Water law, Impounded waters, Obstruction to flow, Drainage, Watercourses (Legal), Diversion, Overflow, Ditches, Water supply, Flooding, Accretion (Legal aspects), Alteration of flow.
Identifiers: *Estoppel, *Reciprocal easements, Implied consent, Statute of limitations.

The situations where an owner of land bordering on a stream or lake erects a dam and floods the lands above and where a natural stream is diverted from its original channel into a new one are considered in this article. The subject of inquiry is the riparian rights which may or may not accrue to the owners of land bordering on artificially created lakes and watercourses; the subject is approached through an analysis of judicial decisions dealing with the subject. The courts use three different rationales in finding riparian rights in these cases: (1) if an artificial lake or watercourse is maintained for a sufficient length of time, it should be regarded as natural; (2) each party acquired rights in the property of the other by a similar course of conduct, adverse usage or prescription (the theory of resulting reciprocal easements); and, (3) the plan inaugurating the flowage is deemed to have grown out of mutual understanding and assent (the theory of estoppel). The author concludes from his case analysis that while most jurisdictions find riparian rights where they should, the rationale for the decisions is often poor. (Keith-Florida)
W70-00797

NAVIGABLE WATERS--RIGHT OF RIPARIAN OWNER TO ARTIFICIAL ACCRETION,
Marion W. Smith.
Miss L J, Vol 25, No 2, p 174-175, Mar 1954. 2 p, 10 ref.

Descriptors: *Alabama, *Accretion (Legal aspects), *Riparian land, *Federal government, Avulsion, Judicial decisions, Riparian rights, Dredging, Legal aspects, Boundaries (Property), Beds, Beds under water, Landfills, Land forming, Land, Shores, Boundary disputes, Channel improvement, Land classification, Governments.

The Alabama Supreme Court ruled in State v Bill, 66 So 2d 141 (Ala 1953) that title to fifty-six acres of land, created by dredging and piling against the riparian owner's shoreline, was in the riparian owner because of the doctrine of accretion. At common law, accretion had to be gradual and imperceptible. In this instance it was man-made, rapid and perceptible. The court ruling conflicts with both the common law doctrine of avulsion and established case law which would have vested title in the sovereign. The result, although just, should not have been reached upon the basis of accretion because it was neither gradual nor imperceptible. (Darragh-Florida)
W70-00798

COMMON LAW RIGHTS TO SURFACE WATERS,
Robert S. Stewart.
Notre Dame Lawyer, Vol 21, No 4, p 364-366, June 1946. 3 p, 9 ref.

Descriptors: *Surface waters, *Drainage water, *Repulsion (Legal aspects), *Riddance (Legal aspects), Runoff, Standing waters, Surface runoff, Ditches, Drainage, Drainage systems, Drains, Relative rights, Diversion, Retention, Channels, Land, Overland flow, Rain water, Surface drainage, Water sources, Hydrology, Running waters, Wetlands.

Surface waters are waters that fall from the skies or arise in springs. They diffuse themselves over the surface of the ground following no defined course or channel and are lost by diffusion, percolation, evaporation, or natural drainage. Under the civil law rule, as between upper and lower ground owners, the lower proprietor's land was subject to an easement of natural surface water flow from the upper proprietor's land. Under the common-law rule, a landowner may control both the water falling on his land and that flowing across it. He may refuse to receive water originating on, or flowing over, adjoining property. The retention, diversion, repulsion, or altered transmission of surface water is not actionable even though damage ensues. Courts have often modified the common-law rule to fit each individual case. Some courts have stated that the upper proprietor may not accumulate surface water in a ditch or drain and thereby increase the flow and discharge onto the lower estate; nor may the proprietor change the direction of such water. The true common-law rule seems preferable since modifications of the rule create confusion. (Marsee-Florida)
W70-00799

STATUTES-EXTENT OF THE AUTHORITY OF THE DEPARTMENT OF CONSERVATION.
Tul L Rev, Vol 21, No 3, p 504-507, Mar 1947. 4 p.

Descriptors: *Louisiana, *Leases, *Administrative agencies, *Legislation, Conservation, Judicial decisions, Remedies, Dredging, Contracts, Administrative decisions, Shellfish, Natural resources, State governments, Lakes, Riparian rights, Legal aspects, Relative rights, Oysters, Clams.
Identifiers: Injunctions (Mandatory).

In the case of Gorham v Mathieson Alkali Works, 27 So 2d 299 (La 1946), plaintiffs, riparian owners brought suit to enjoin defendant from dredging the bottoms of various lakes. The defendant had been given a lease under a contract from the Department of Conservation to remove oysters and clam shells from the lake bottoms. Plaintiffs contended there was no statutory authority to grant the lease. The appellate court, reversing the trial court, held that the Department did have authority to grant the contracts of lease. The Department was created to protect, manage, and conserve the natural resources of the state. The language of the act is broad but alone does not give the Conservation Commission the right to sell or lease any natural resources. However, when read in conjunction with a 1914 act, which gives the Commission both the right to sell and grant the privilege of taking oyster shell deposits from Gulf Coast waters and the right to make contracts leasing the right to remove such shell deposits, the contracts to lease in the instant case come within the authority granted by statute. (Heckerling-Florida)
W70-00800

CONSTITUTIONAL LAW-NAVIGABLE WATERS-EXTENSION OF THE FEDERAL PREROGATIVE,
Orton A. Jones.
W Va L Rev, Vol 63, No 1, p 59-62, Dec 1960. 4 p.

Descriptors: *West Virginia, *Navigable rivers, *Federal-state water rights conflicts, *Federal jurisdiction, Non-navigable waters, Legal aspects, Hydroelectric plants, Federal government, Oklahoma, Flood control, Regulation, Navigation, Judicial decisions, United States, Watersheds (Basins), Eminent domain, Public benefits, Federal project policy, Federal reclamation law, Compensation, Hydroelectric power, Condemnation value, Jurisdiction, State jurisdiction, Tributaries.
Identifiers: *Hydroelectric franchises, Due process, Grand River, Arkansas River.

In United States v Grand River Dam Authority, 80 S Ct 1134 (1960), the federal government instigated a hydroelectric project on a non-navigable tributary of a navigable river; the project was in a location for which a state agency held a hydroelectric franchise. When the agency demanded compensation for the taking of its rights, the Court of Claims held the government liable. The Supreme Court reversed and held that there is no taking of property when the United States asserts jurisdiction to regulate navigable streams, and federal jurisdiction extends to non-navigable tributaries of navigable streams. The history of the expanding federal jurisdiction over 'navigable waters' is traced

through an analysis of judicial decisions. Three conclusions follow from the case analysis: (1) the expansive nature of federal jurisdiction in the area is a function of the successive definitions of the term 'navigable waters'; (2) the Grand River case extended jurisdiction from non-navigable portions of a navigable stream to non-navigable tributaries of a navigable stream; and (3) the Grand River case indicates a trend toward a rule that would afford the federal government a prerogative over all streams that could be classified as the watershed of a navigable waterway. (Keith-Florida)
W70-00801

WATERS AND WATERCOURSES - EASEMENTS - IMPLIED DEDICATION OF FLOWAGE EASEMENT APPURTENANT TO A DAM,
James S. Moore, Jr.
Tex L Rev, Vol 34, No 3, p 493-494, Feb 1956. 2 p.

Descriptors: *Minnesota, *Easements, *Water level fluctuations, *Impounded waters, Judicial decisions, Watercourses (Legal), Legal aspects, Dams, Lakes, Legislation, Water law, Overflow, Condemnation, Flood control, Conservation, Recreation, Flooding, Texas, Variability, Flow characteristics.
Identifiers: *Flowage easements, *Implied dedication, Easement by prescription, Common-law dedication.

In State v Fischer, 71 NW 2d 161 (Minn 1955), the defendants' lands had been continually flooded for over fifteen years by public lake waters impounded by a dam. The State of Minnesota sued to establish a flowage easement by implied dedication, relying in part on a state statute. The defendants offered evidence that water levels had fluctuated during the fifteen-year period. The trial court found a flowage easement in the state and the state supreme court reversed. The standard requisites for common-law dedication of an individual's land to the state are the landowner's expressor implied consent to dedicate to the public use and the public's acceptance through its use. One court and the Minnesota Legislature have attempted to supplement the common-law principles of dedication by stating that a set number of years continuous flowage by public waters is conclusive evidence of dedication. The problem incurred with such supplementation is that it does not achieve the desired result of easing the state's burden of proof in cases where the water level fluctuates; this is because dedication, as construed by the courts, applies only to that land continuously flooded. (Keith-Florida)
W70-00802

RIPARIAN RIGHTS - RIGHT TO FOLLOW ACCRETIONS ACROSS FIXED BOUNDARY LINE.

Tenn L Rev, Vol 19, No 6, p 862-864, Feb 1947. 3 p, 10 ref.

Descriptors: *Tennessee, *Accretion (Legal aspects), *Erosion, *Riparian rights, Legal aspects, Judicial decisions, Mississippi River, Channels, Bank erosion, Riparian land, Boundaries (Property), Banks, Relative rights, Severance, Boundary disputes, Navigable rivers.
Identifiers: *Riparian owners, *Non-riparian owners.

Plaintiff was the riparian owner of a tract on the Mississippi River; defendant was the non-riparian owner of a tract adjacent and upland to that of the plaintiff. The plaintiff's land completely eroded away and by 1917 the defendant had become a riparian owner. When the process of accretion returned the two tracts of land to their pre-erosion status, the plaintiff brought an action of ejectment. The court held that when land originally non-riparian becomes riparian because of erosion, the now riparian landowner becomes vested with the rights of a riparian owner and entitled to all accretions to his ripa even though such accretions extend across a fixed boundary line and occupy a space which was once that of another. The courts of this country follow the general rule that riparian owners are entitled to additions to their land caused by the process of accretion, but there is conflict among states when the accretions cross a boundary line and cover an area formerly held by another and lost by him due to erosion. The Connecticut rule, which represents the weight of authority, is that accretions belong to the ripa to which they attach. (Keith-Florida)
W70-00803

EQUAL FOOTING AND THE MARGINAL SEA,
Jack C. Terry.
U Kansas City L Rev, Vol 19, p 66-71, 1967. 6 p, 50 ref.

Descriptors: *Federal government, *California, *Louisiana, *Texas, Judicial decisions, Subsoil, Low water mark, Ownership of beds, Tidal waters, High water mark, Oil, International waters.
Identifiers: *Marginal sea, Tidelands, Constitutional law.

The United States Supreme Court has decided three cases involving the question of ownership of subsoil under the marginal sea off the coasts of California, Louisiana, and Texas. All three cases were decided in favor of the United States rather than the adjacent states involved. The land in question lies between the low tide mark on the beaches and the three mile United States territorial limit. This land is now of considerable value due to oil discoveries. This comment deals with the Texas appeal for a rehearing. Texas contended that it should be treated differently from the other states because it was an independent nation prior to admission to the Union. This theory was not accepted because Texas was admitted to the Union on an equal footing with the original states in all respects. (Watson-Florida)
W70-00804

CANALS AND WATERWAYS.

Ill Ann Stat ch 19, secs 8-37.24 (Smith-Hurd 1963), as amended, (Supp 1969).

Descriptors: *Illinois, *Regulation, *Canals, *Transportation, Michigan, Legislation, Administration, Open channels, Ditches, Drains, Inland waterways, Locks, Navigation, Dams, Riparian rights, Docks, Drains, Banks, Navigable waters, Obstruction to flow, Administrative agencies, Legal aspects.
Identifiers: Penalties.

The powers and duties of the Illinois Department of Public Works and Buildings with relation to the Illinois and Michigan canal, including its feeders, basins, and property including locks, dams, and navigation improvements of the Illinois and Little Wabash rivers are set forth. Rules and regulations regarding tolls and navigation as well as leasing and selling provisions concerning land, ice harvesting, and riparian rights are included. The Department shall establish title to the canal lands in the state and keep the canal, locks, and dams in good condition. No drains or ditches may be dug or sand or gravel taken without the Department's consent when such action causes injury to the canal. No wharves may be constructed or the banks of the canal used without the Department's consent. The lock gates shall not be interfered with and the canal's use may not be interfered with. No bridge may be constructed over the canal without the approval of the Department. The canal is abandoned as a carriage for commerce. Canal lands not needed for public purposes shall be sold. (Moulder-Florida)
W70-00814

ILLINOIS DRAINAGE LAW (A COMMENTARY),
Illinois State Bar Association.
Donald V. Dobbins.
39-42 Ill Ann Stat XIX-XXXV (Smith-Hurd 1956).

Descriptors: *Illinois, *Drainage districts, *Drainage systems, *Administrative agencies, Legislation, Drainage, Drainage programs, Drains, Ditches, Levees, Natural flow doctrine, Repulsion (Legal aspects), Assessments, Construction, Costs, Right-of-way, Condemnation, Local governments, Water law.
Identifiers: Subdistricts.

While repealing previous acts, the Illinois Drainage Code of 1955 retains the classifications and organization of drainage districts established under the 1879 Levee Act and the 1885 Farm Drainage Act. Those acts authorized the establishment of drainage and levee districts, mutual districts, outlet districts, one township districts, union districts, special districts, and river districts to be governed by commissioners. The Code grants exclusive jurisdiction over the organization and operation of all districts to the county court for the county wherein the district lies, but retains the same commissioner structure. The Code specifies methods for organizing new districts. Assessments for drainage district costs are characterized as original, annual maintenance, and additional and are assessed by the individual districts upon county court approval. Commissioners' general powers under the code include specific powers to: (1) obtain rights-of-way by agreement or condemnation; (2) enter into contracts for district purposes; (3) establish an emergency operating fund; (4) issue notes and bonds of the district; and (5) incur other debts. The Code allows detachment of lands from a district for storm drainage purposes, and permits annexation of lands to existing districts. (McDonough-Florida)
W70-00815

ISLANDS AND ABANDONED RIVER CHANNELS.

Iowa Code Ann secs 568.1-568.25 (1950), as amended, (Supp 1969).

Descriptors: *Iowa, *Beds, *Ownership of beds, *Islands, Legislation, River beds, Stream beds, Banks, Navigable rivers, Rivers, Dry beds, Channels, Boundaries (Property), Surveys, Appraisals, Leases, State governments, Boundary disputes, Land tenure, Legal aspects.

Upon application to the Secretary of State by the county auditor or a prospective purchaser land, bars, or islands in channels of abandoned and unusable navigable streams may be sold. The Secretary may order a survey of the land by the county surveyor, or he may use a prior recorded survey. Three disinterested freeholders are appointed to appraise the land. First purchase rights are reserved for a person who has occupied the land as a home for at least three years, upon prompt filing of an application. Otherwise the land is sold by advertised bids for not less than the appraised value. If no applications or bids are received, the land may be leased, at the end of which period it is re-advertised for sale. If such lands are in the possession of any person, company, or corporation that has claimed ownership for over ten years and has paid taxes and made valuable improvements, they may be sold to said claimant. The Attorney General must first quit title and determine the value of the land by filing suit in the district court. River islands may be sold or leased after survey and appraisal. (Douberley-Florida)
W70-00817

LEVEES.
Ky Rev Stat Ann secs 266.010-266.990 (1963).

Descriptors: *Levees, *Kentucky, *Regulation, *Administrative agencies, Legislation, Eminent domain, Engineering structures, Local governments, Adjudication procedure, Administrative decisions, Easements, Equitable apportionment, Judicial decisions, Compensation, Construction costs, Assessments, Loans, Maintenance costs, Taxes, Decision making, Legal aspects, Planning, Financing.

The establishment of levees by the county court in any county in Kentucky when it is conducive to the public welfare or public utility is provided for. Upon petition setting forth the necessity for a levee, the court shall appoint impartial commissioners to study the proposed plans and make specific recommendations in a report. Details of this report and the procedure for exceptions to the proposed levee are outlined. If the plans are approved, a board of five levee commissioners is appointed by the court. The term, method of election, bond, and compensation of the board are provided. The board's duty to superintend the construction, care, and protection of the levee is detailed, and powers are given to perform these duties. These include power to enter agreements with the federal government, acquire land, levy an annual tax, borrow funds, issue bonds, and make any other additional assessments. All lands in the levee district are subject to a lien for the costs of the levee. Fines for violations of provisions in the chapter are provided. (Schram-Florida)
W70-00818

LEVEES.
Ky Rev Stat Ann secs 266.010-266.110 (1963).

Descriptors: *Levees, *Kentucky, *Administrative agencies, Legislation, Eminent domain, Engineering structures, Local governments, Adjudication procedure, Administrative decisions, Easements, Equitable apportionment, Judicial decisions, Compensation, Construction costs, Assessments, Loans, Taxes, Maintenance costs, Decision making.

This chapter enables the county court in counties of less than 200,000 population to establish and aid in the construction of any levee along a river or watercourse within or bounding the county. A petition, signed by five landowners, setting forth the necessity for the levee and sufficient surety bond are required. Upon filing the petition, the county court shall appoint three impartial commissioners who shall: (1) survey the proposed site of the levee; (2) ascertain the names of the owners and tenants of the land; (3) assess a just compensation for the land required for the levee; and (4) make a signed written report to the court setting forth this information with a map of the proposed route of the levee. If the report is favorable, the court shall issue process against the required land. If exceptions are filed, there shall be a trial and, if needed, an appeal on the issues. If the court decides that the levee should be established, it shall so order, and every four years thereafter appoint a board of five levee commissioners who are resident landowners of the vicinity of the levee. (Schram-Florida)
W70-00819

LEVEES.
For primary bibliographic entry see Field 06E.
W70-00820

DRAINAGE AND RECLAMATION ACT OF 1912.
Ky Rev Stat Ann secs 267.010-267.990 (1963).

Descriptors: *Kentucky, *Drainage programs, *Reclamation, *Drainage districts, Legislation, Multiple-purpose projects, Drainage, Surface drainage, Ditches, Drainage engineering, Land reclamation, Canals, Drains, Administrative agencies, Coordination, Decision making, State governments, Water policy, Water law, Eminent domain, Assessments, Tax rate, Maintenance, Construction.

This act empowers any county court to establish and have constructed any ditch, drain, or canal for the purpose of draining low, swampy, or overflowed land. Broad powers are distributed among the court, a board of viewers, drainage district directors, and county drainage commissioners. These powers include taxation and the right of eminent domain. The act contains numerous procedural details covering bonding, organization of districts, assessments, and collections. Specific powers are granted to each of the supervisory boards in relation to methods of hiring, construction, and maintenance. In addition, such board's duties are outlined in detail. Financing methods are discussed in detail and include the right to place liens against the land within each drainage district to insure payment of assessments. Finally, provisions for establishing and organizing districts are stipulated. (Schram-Florida)
W70-00821

DRAINAGE AND RECLAMATION ACT OF 1912.
Ky Rev Stat Ann secs 267.010-267.240 (1963).

Descriptors: *Kentucky, *Drainage programs, *Reclamation, *Drainage districts, Legislation, Multiple-purpose projects, Drainage, Surface drainage, Ditches, Drainage engineering, Land reclamation, Canals, Drains, Administrative agencies, Coordination, Decision making, State governments, Water policy, Water law, Eminent domain, Assessments, Tax rate, Maintenance, Cost-benefit analysis, Construction.

Power is given to any county court to have constructed a ditch, drain, or canal to reclaim swampy or overflowed land upon petition by landowners in the affected area. Procedural provisions, such as bonding, a board of viewers to examine and report on feasibility, and confirmation, are outlined. Upon a favorable report from the board of viewers, a board of directors and a drainage district are to be established. The commissioners, consisting of directors from each district have the power to acquire land and any other powers necessary to carry out the provisions of this chapter, including eminent domain. A drainage engineer is to be hired to map, profile, and plan the needed construction. The board of viewers is given the power to classify and assess land within the district and to determine the rate of assessment. Additional provisions including estimates of cost, assessments of benefits, and assessment of compensable damages are outlined. The court is to keep a record of all drainage within the district, certified by the county clerk. (Schram-Florida)
W70-00822

DRAINAGE AND RECLAMATION ACT OF 1912.
Ky Rev Stat Ann secs 267.250-267.330 (1963).

Descriptors: *Kentucky, *Drainage programs, *Reclamation, *Drainage districts, Legislation, Multiple-purpose projects, Drainage, Surface drainage, Ditches, Drainage engineering, Land reclamation, Canals, Drains, Administrative agencies, Coordination, Decision making, State governments, Water policy, Water law, Eminent domain, Assessments, Tax rate, Maintenance, Condemnation, Construction, Financing.
Identifiers: *Bonds.

Payment for work done under this chapter is to be made in monthly installments. When it is necessary for the purposes of this act, contractors shall have the right of access and power to remove certain obstructions. Methods of construction when an improvement crosses railroad property are set forth. When the purchase of land needed for a right of way is not possible, procedures for condemnation are proposed. Details for an assessment role, including the statement of costs, what the role shall include, and provisions for hearings on the role and statement are outlined. Additional provisions are made for payment and collection of assessments when it averages less than twenty-five cents per acre. When the average assessment is more than this amount, bonds are authorized, and failure to pay the assessment is consent to the bonds. In addition, procedures are outlined for issuance and sale of these bonds and collection of assessment installments. (Schram-Florida)
W70-00823

DRAINAGE AND RECLAMATION ACT OF 1912.
Ky Rev Stat Ann secs 267.340-267.500 (1963).

Descriptors: *Kentucky, *Drainage programs, *Reclamation, *Drainage districts, Legislation, Multiple-purpose projects, Surface drainage, Drainage, Ditches, Drainage engineering, Land reclamation, Canals, Drains, Administrative agencies, Coordination, Decision making, Water policy, Water law, Maintenance, Assessments, Financing, Obstruction to flow.

Either the board or the county court is empowered to change assessments and relevy to cover any deficit caused by unforeseen circumstances. Liability of successors in title and contribution for joint owners are provided. Provisions for liens of assessments and enforcement of same are provided. Maintenance procedures are outlined and provisions for hiring of a drainage superintendent and an attorney for the board are made. Financial details are dealt with and it is provided that expenses should be apportioned among the districts. Landowners may use these improvements as an outlet for lateral drains. Natural drains which receive water from the public drains and ditches in this section are to be under the control of the act as extensions of the public ditch. Any obstructions or damage caused by adjoining landowners will be charged to them. Provisions for a drainage commissioner and board of supervisors in counties having seventy-five or more districts are outlined. Procedures for establishing separate districts are also included. (Schram-Florida)
W70-00824

DRAINAGE AND RECLAMATION ACT OF 1912.
Ky Rev Stat Ann secs 267.520-267.990 (1963).

Descriptors: *Kentucky, *Drainage programs, *Reclamation, *Drainage districts, Legislation, Multiple-purpose projects, Surface drainage, Drainage, Ditches, Land reclamation, Canals, Drains, Administrative agencies, Coordination, Decision making, Water policy, Water law, Assessments, Tax rate.

The members of the district drainage board shall qualify and organize in the same manner as the county board. The powers and duties of the district board shall also be the same as the county board within its own district. They shall have full jurisdiction and control over the work provided for under the proceeding for which they were established. An amendment of the order establishing the district to change the name of any landowner or description of land can be made at any time. Drainage districts may be enlarged so as to include other contiguous land upon petition of the board to the county court. The fiscal court of any county shall retain control of improvements made by general taxation and may make appropriation to aid any drainage district within the county. A majority, either in amount or number, of those assessed for the maintenance of any improvement may petition for discontinuance of the improvement. (Schram-Florida)
W70-00825

FLOOD CONTROL ACT.
Ind Ann Stat 27-1101 thru 27-1109 thru 27-1134 (1960), as amended, (Supp 1968).

Descriptors: *Indiana, *Administrative agencies, *Flood control, *Water resources development, Legislation, Floodways, Channel improvement, Flood plains, Multiple-purpose projects, Project planning, Planning, Administration, Cities, Floodwaters, Water resources, Taxes, Tax rate, Adjudication procedure, Obstruction to flow, Eminent domain, Loans, State governments, Appropriation, Drains, Levees.

To control floods and preserve Indiana's water resources, and to establish a comprehensive plan toward those goals, the Natural Resources Commission is granted enumerated powers and duties. There are provisions for cooperation by the Commission with federal and state agencies and for the establishment of floodways. Procedures are set forth for the removal and regulation of obstructions placed in floodways and for the approval of flood control works by the Commission. Orders of the Commission may be appealed. The act makes provision for appropriations to fulfill the purposes of the act, and the Flood Control Revolving Fund, from which loans are made to municipalities for the institution and accomplishment of flood control programs, is created. Flood control programs may be instituted by municipalities with the approval of the Commission and the State Board of Finance. Municipalities may levy annual taxes for flood control purposes. The act defines flood, flood water, flood flow, channel, flood plains, floodway, flood control, flood easement, and water resources. (Marsee-Florida)
W70-00827

FLOOD CONTROL ACT.
Ind Ann Stat 27-1101 thru 27-1103, 27-1109 thru 27 1117 (1960), as amended, (Supp 1968).

Descriptors: *Indiana, *Administrative agencies, *Flood control, *Water resources development, Legislation, Floodways, Channel improvement, Flood plains, Multiple-purpose projects, Project planning, Planning, Administration, Cities, Floodwater, Water resources, Obstruction to flow, Eminent domain, Governments, State governments, Federal government, Regulation, Control, Surveys, Reservoirs.

To control floods and preserve Indiana's water resources, the Natural Resources Commission has the powers and duties to: (1) establish comprehensive plans for flood control and preservation of water resources; (2) require information from local officials; (3) utilize other state agencies and employ technical experts; (4) enter upon lands or waters for purposes of investigation; (5) conduct hearings; (6) exercise the power of eminent domain; (7) cooperate with state and federal agencies; (8) maintain actions to abate nuisances; (9) encourage local initiative in flood control; (10) grant easements and the rights to construct and operate flood control structures; (11) exercise jurisdiction over public and private waters for purposes of flood control; (12) grant or deny applications for obstructions to be placed in floodways and remove obstructions; (13) make surveys of water resources; and (14) obtain recommendations from the Department of Conservation water, flood flow, channel, flood plains, floodway, flood control, flood easement, and water resources. (Marsee-Florida)
W70-00828

FLOOD CONTROL ACT.
Ind Ann Stat secs 27-1118 thru 27-1134 (1960), as amended, (Supp 1968).

Descriptors: *Indiana, *Administrative agencies, *Flood control, *Water resources development, Legislation, Multiple-purpose projects, Administration, Taxes, Tax rate, Adjudication procedure, Loans, Governments, State governments, Financing, Appropriation, Floodways.

The Natural Resources Commission may establish any floodway as a commission floodway and may alter or terminate the same. All flood control works must be coordinated in design, construction, and operation and must be approved by the Commission. Persons affected by a Commission order relative to commission floodways or to the approval of flood control works may appeal to the courts as provided herein. Loans may be made to municipalities, for the purpose of accomplishing flood control programs, from the Flood Control Revolving Fund. Municipalities may institute and administer flood control programs, when approved by the State Board of Finance and the Commission, and may levy an annual tax on real and personal property for such purpose. No loan may be made to a municipality unless: (1) proper application has been made; (2) approval has been granted by the state Board of Finance and the Commission; and (3) assurance is given by the municipality that the flood control program will be satisfactorily maintained. The State Board of Finance and the Commission must ascribe to loan applicants a priority rating based on the need for a flood control program. (Marsee-Florida)
W70-00829

INTERSTATE DRAINS.
Ind Ann Stat secs 27-2601 thru 27-2606 (Supp 1968).

Descriptors: *Indiana, *Drainage programs, *Interstate commissions, *Local governments, Drainage, Cost sharing, Construction costs, Legislation, Construction, Drainage engineering, Benefits, Damages, Planning, Repairing, Administrative agencies, Assessments, Interstate compacts, Legal aspects.

Whenever proceedings are initiated in this or any adjoining state to construct or reconstruct a drain which will affect lands in both states, the county board of the county affected shall have authority to join the other state in the effort to construct such drain. Upon receipt of an offer from the other state or an acceptance of this state's offer, such board shall proceed to form an interstate board, electing a chairman and clerk from different states. The interstate board members from this state shall have half the votes of that board. The board may hire an engineer to work with the county surveyors. Upon receipt of a report, the Drainage Board of Indiana shall assess the benefits and damages to each tract of land in this state. Whenever improvement is established in both states and funds are available, the interstate board shall meet and let work contracts. (Smith-Florida)
W70-00830

DRAINAGE OF WATER FROM PUBLIC ROADS; AND REPAIR OF FLOOD DAMAGE TO CERTAIN ROADS.
For primary bibliographic entry see Field 06E.
W70-00832

BRIDGES - GENERAL PROVISIONS.
Miss Code Ann secs 8420-8434 (1956).

Descriptors: *Mississippi, *Bridges, *Culverts, *Bridge construction, Local governments, State governments, Gulf of Mexico, Construction, Construction costs, Financing, Planning, Project planning, Cost allocation, Legal aspects, Legislation, Highways, Condemnation.

All bridges and culverts hereinafter built or placed in state roads must be the full width of the crown of the roadway. The boards of supervisors of counties bordering on tidewaters of the Gulf of Mexico are empowered to provide illumination for bridges and other parts of public highways within their counties. The boards may further establish, operate, and maintain toll bridges or ferries on any part of a public road. The boards are empowered to purchase or to acquire by condemnation, privately-owned bridges where these link segments of public roads. The boards may purchase toll bridges, except for interstate or state operated bridges, and may maintain them in a toll-free status. Where a bridge is necessary between two or more counties, the boards of supervisors of the respective counties may join in such bridge's construction and financing. If no agreement can be reached, a single county board may construct and maintain the bridge, provided it secures the consent of the other counties involved. (Kelly-Florida)
W70-00833

4B. Groundwater Management

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 5 CONSUMPTIVE USE OF WATER: COMMON LAW RULES,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W70-00532

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
For primary bibliographic entry see Field 05G.
W70-00542

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
For primary bibliographic entry see Field 05G.
W70-00543

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
For primary bibliographic entry see Field 05G.
W70-00544

THE MOVEMENT FOR NEW WATER RIGHTS LAWS IN THE TENNESSEE VALLEY STATES,
For primary bibliographic entry see Field 06E.
W70-00577

THE QANATS OF IRAN,
H. E. Wulff.
Scientific American, Vol 218, No 4, p 94-100; 105, 1968. 10 fig.

Descriptors: *Aqueducts, *Arid lands, *Water conveyance, *Water supply, *Aquifers, Irrigated land, Construction costs, Irrigation systems, Channels, Foreign construction, Irrigation operation and maintenance.
Identifiers: *Qanats, *Iran.

Most of Iran is arid, receiving only 6 to 10 inches of rainfall a year. Yet Iran is a farming country that grows its own food and also exports food and fiber. 75% of all water is provided by some 22,000 qanats - hand-dug underground channels that conduct water by gravity from highland aquifers to arable plains. This system was started some 3,000 years ago. This paper reviews the history of qanats, methods of construction, current problems of rising costs, and land reforms - all of which may bring about a switch to individual wells and pumps to meet new demands for irrigation water. (Crouse-Arizona)
W70-00692

NOTES ON PROBLEMS OF IRRIGATION IN THREE LIBYAN OASES,
Lars Eldblom.
Ekistics, Vol 23, No 137, p 199-202, 1967. 8 fig, 3 ref.

Descriptors: *Irrigation practices, *Arid lands, *Irrigated land, *Shallow wells, *Artesian wells, Water rights, Rotations, Land use, Water supply, Pumps.
Identifiers: *Oases, *Lybia, Land use pattern.

This paper presents findings at three irrigated oases in Lybia. Use of shallow, dug wells results in an irregular boundary and scattered gardens with long crop rotation periods. Artesian wells create a more compact structure with shorter rotations and thus, soil fertility problems. Water is drawn from most shallow wells by ancient lever (Khettera) or pulley (Dalou) devices. Engine driven pumps are used on some of the better wells, but are of limited economic value owing to restricted water supply,

high costs and maintenance problems. Use of pumps or enlargement of wells tends to raise problems regarding partition of land between already cultivated gardens. (Crouse-Arizona)
W70-00703

WATER SUPPLY, USE AND MANAGEMENT,
F. Dixey.
In E S Hills, Ed, Arid Lands: A Geographical Appraisal, London, Methuen, p 77-102, 1966. 13 fig, 49 ref.

Descriptors: *Water supply, *Water utilization, *Arid lands, *Surface waters, *Groundwater, Hydrologic cycle, Water harvesting, Ephemeral streams, Water quality, Water table, Aquifers, Southwest U.S., Artificial recharge, Groundwater mining, Saline water intrusion, Confined water.
Identifiers: *Qanats, Australia, North Africa, USSR, Fossil water.

This chapter is a broad review of the state of knowledge of management and use of arid lands water supplies through 1965. The way arid land waters are managed has profound effect on quantity, quality and timing of water available for beneficial use by man. Social and economic as well as purely physical aspects must be considered for optimum development in arid lands. Particular emphasis is placed on groundwater since it is normally a more reliable source than fluctuating or ephemeral surface waters in arid zones. The qanats of the Middle East and Asia, artesian wells and natural and artificial recharge of aquifers underlying dry but arable lands are discussed. The hazards of mismanagement of groundwater are emphasized. All of these forms of mismanagement can cause a decline in both quantity and quality of water available, increasing costs and subsequent decline in economic value of the groundwater body. (Crouse-Arizona)
W70-00706

NORTH CAROLINA AND OTHER ATLANTIC STATES,
For primary bibliographic entry see Field 06E.
W70-00770

CURRENT DEVELOPMENTS IN GROUND WATER LAW.

Am Water Works Assn J, Vol 41, No 11, p 1002-1012, Nov 1949. 11 p.

Descriptors: *Groundwater, *Legislation, *Water allocation (Policy), Well permits, Well regulations, Subsurface waters, Water permits, Non-consumptive use, Water utilization, Preferences (Water rights), Appropriation, Prior appropriation, Priorities, Air conditioning, Water resources, Administrative agencies, Water supply.

The legislative developments in limiting the use of ground water are discussed. In Indiana, legislation limiting the use of ground water for cooling air will soon be supplemented by proposed legislation which will allow limiting the use of ground water where its withdrawal exceeds or threatens to exceed the natural replenishment of such waters. In Kansas, legislation requires persons intending to acquire an appropriation right to waters to apply to the state for a permit in order to establish priority. New Jersey generally allocates waters on application after proof of public necessity, non-interference with existing water supplies, protection of the supply from contamination, and protection of the dry weather flow of the stream. Recent legislation also allows the regulation of private wells. In New York, the Water Power and Control Commission must approve all applications involving the development of new water supplies. A serious deterioration of ground water conditions in four Long Island counties brought forth recent legislation which requires licensing of all well drillers within those counties. Ohio has legislation regulating defective wells. Legislation also requires well drillers to submit logs of all water wells drilled. (Gabrielson-Florida)
W70-00774

4C. Effects on Water of Man's Non-Water Activities

DEPARTMENT OF CONSERVATION.
Minn Stat secs 84.156 thru 84.162, 84.415, 84.43 thru 84.45 (1964), as amended (Supp 1968).

Descriptors: *Minnesota, *Easements, *Right-of-way, *Conservation, Water conservation, Dams, Condemnation, Overflow, Utilities, Permits, Federal government, Overland flow, Water control, Highways, Legislation, Damsites, Public health, Natural resources, Boating regulations, Boats, Public lands, Resource development, Administrative agencies, United States.
Identifiers: *Flowage easements, Public waters.

The United States is granted an easement and right to flow and overflow the right-of-way of any highway lying within the Lac qui Parle Water Control Project below the 945.0 foot elevation. The state Commissioner of Conservation is authorized to acquire the underlying fee title or right to flow to the right-of-way of any highway lying within such water control project and to transfer same to the United States. The Commissioner is also authorized to acquire all dam site and flowage easements necessary to accomplish the purposes of this section and to construct all control works needed to restore and control the water level. The right to condemn land and to enter into contracts with the United States is also given. The Commissioner may grant licenses to utility companies permitting passage over, under, or across state-owned lands or water. Such permits are subject to revocation if in conflict with a public use of the land or water. The regulation of watercraft is declared necessary for the protection of public health and for the conservation of natural wilderness conditions and other natural resources. The Commissioner is empowered to designate wilderness areas. (Schram-Florida)
W70-00583

A CLIMATOLOGICAL EVALUATION OF PRECIPITATION PATTERNS,
Public Health Service, Washington, D.C.
J. P. Changnon, Jr.
SEC Technical Report A62-5, Symposium, Air Over Cities, Nov 1969, Cincinnati, Ohio, p 37-67. 6 fig, 11 tab, 17 ref.

Descriptors: *Urbanization, *Urban effects, *Rainfall distribution, *Raingages, *Distribution patterns, Temperature, Air pollution.
Identifiers: Champaign-Urbana urban area, Seasonal precipitation pattern, Synoptic conditions.

A 13-year measurement program of urban rainfall distribution in Champaign-Urbana, a moderate sized municipality of Illinois is described in this article. The monthly, seasonal, and annual precipitation patterns derived from the network data are discussed. The annual precipitation pattern is compared with that of a nearby rural network to help evaluate the apparent urban-affected precipitation pattern obtained over the urban area. The urban effects have been claimed to produce increases in precipitation on the order of 5 to 15%. The results of Champaign-Urbana study have shown that the precipitation maximization in Urbana could easily be claimed to result either from urban effects or from natural variations of precipitation. Raingage exposures presented a problem in the evaluation of effects. To instrument an urban area for this purpose is difficult and tremendously expensive. Natural variations of precipitation pose another problem. (Upadhyaya-Vanderbilt)
W70-00740

4D. Watershed Protection

CIVIL LAW PROPERTY--ALLUVION DISTINGUISHING LAKES FROM RIVERS AND STREAMS,
Kenneth E. Gordon, Jr.
La L Rev, Vol 25, No 2, p 554-558, Feb 1965. 5 p, 19 ref.

Descriptors: *Louisiana, *Alluvion, *Riparian rights, *Classification, Water law, Remedies, Rivers, Streams, Lakes, Evaluation, Navigable rivers, Navigation, Accretion (Legal aspects), Bank erosion, Silts, Erosion, Channel morphology, Sediments, Boundaries (Property), Judicial decisions, Geologic investigations, Legal aspects.

The classification of a body of water as a stream, river, or lake has important consequences in Louisiana property law. The governing article of the Louisiana Civil Code does not refer to lakes in its application of the rules of accretion formed to any soil on the shore of a river or other stream. The crucial question becomes whether a particular body of water is to be classified as a lake, a river, or a stream and what test should be employed to make the classification. Jurisprudence prior to State v Cockrell, 162 So 2d 361 (La. App 1st Cir. 1964), indicates that a body of water is a river or stream if the water moves, albeit not constantly and has the power to carry silt and form alluvion. In Cockrell, the court went beyond the evidence of current sufficient to carry alluvion and considered other geological characteristics presented by experts as being typical of streams as opposed to lakes. This decision makes possible the use of expert testimony and physical evidence all of which could greatly simplify the difficulties of classifying bodies of water. (Moulder-Florida)
W70-00541

THE CHICAGO WATER DIVERSION CONTROVERSY,
Herbert H. Naujoks.
Marq L Rev, Vol 30, No 3, p 149-176, Dec 1946. 28 p, 45 ref.

Descriptors: *Illinois, *Diversion, *Water resources development, *Legal aspects, State governments, Damages, Remedies, Water pollution, Great Lakes, Water level fluctuations, Diversion losses, Diversion structures, Legislation, Mississippi River, Pollution abatement, Discharge (Water), Drainage effects, Drainage systems, Judicial decisions, Canals, Flow augmentation, Flow control.
Identifiers: *Chicago, Constitutions.

This is the first of two articles dealing with the Chicago Water Diversion Controversy. Part One deals with the history and present status of the controversy. It offers an account of the history and background of this litigation and describes the status of the problem up until 1946. It touches on the legal issues involved, as well as the physical features of the Great Lakes-St. Lawrence system, the Illinois Waterway, the Chicago Drainage Canal, the details concerning sewage disposal in the Chicago area, and related matters. (Heckerling-Florida)
W70-00554

REAL PROPERTY--ALLUVION AND ACCRETION--ARTICLE 509 OF THE LOUISIANA CIVIL CODE,
For primary bibliographic entry see Field 06E.
W70-00560

GREAT LAKES BASIN COMPACT.
For primary bibliographic entry see Field 06E.
W70-00592

ESTABLISHMENT AND SURVIVAL OF SEVERAL GRASSES IN THE SAGEBRUSH TYPE, WEST-CENTRAL NEW MEXICO,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
O. D. Knipe.
US Forest Serv Res Note RM-149, 1969. 2 p.

Descriptors: *Vegetation establishment, *Erosion control, Range management, Revegetation, Vegetation regrowth, Watershed management, Rehabilitation, New Mexico.

Several grasses were drill-seeded in the sagebrush (Artemesia tridentata) type of west-central New Mexico to test their establishment, survival, and erosion control potential. Competition from the existing heavy stand of sagebrush was eliminated by plowing. The species seeded were blue grama (Bouteloua gracilis), pubescent wheatgrass (Agropyron trichophorum), crested wheatgrass (A. desertorum), western wheatgrass (A. smithii), alkali sacaton (Sporobolus airoides), Indian ricegrass (Oryzopsis hymenoides), Russian wildrye (Elymus junceus), and buffalograss (Buchloe dactyloides). A good stand of all wheatgrasses, Russian wildrye, buffalograss, and Indian ricegrass, was obtained, however, at the end of the fourth growing season, the only species present in sufficient numbers were Russian wildrye and buffalograss. Losses of wheatgrass and Indian ricegrass plants was due to below average rainfall during the second growing season after seeding. It was concluded that Russian wildrye and buffalograss are well suited for use in revegetating deteriorated sagebrush sites in west-central New Mexico.
W70-00762

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
Bureau of Mines, Pittsburgh, Pa. Pittsburgh Mining Research Center.
A. G. Sharkey, Jr., J. L. Shultz, T. Kessler, and R. A. Friedel.
Research/Development, Vol 20, No 9, p 30-32, Sept 1969. 3 p, 1 fig, 1 photo, 3 tab, 14 ref.

Descriptors: *Chemical analysis, *Pollutant identification, *Analytical techniques, *Spectrometers, *Mass, Gas Chromatography, Instrumentation, Calibrations, Organic compounds.
Identifiers: *High resolution mass spectrometry.

High resolution mass spectrometry may be used to identify organic pollutants in air and water. A major advantage of the technique is that the elemental compositions of many organic compounds may be determined on essentially total samples. A limitation is that isomers cannot be determined, but this may be overcome by combining mass spectrometry with gas chromatography and other techniques. The high resolution mass spectrographic data of several organic components of combustion and sewage wastes are tabulated and compared with results of analyses of samples of air and water from Pittsburgh. (Knapp-USGS)
W70-00427

RADIOMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF SELENIUM USING 3, 3' - DIAMINOBENZIDINE AS THE INITIAL REAGENT,
Missouri Univ., Kansas City. Dept. of Chemistry.
James H. Wiersma, and Peter F. Lott.
Anal Letters, No 1 (10), p 655-667, 1968. 13 p, 1 fig, 2 tab, 15 ref. NIH Grant USPH GM 12830-02. OWRR Proj No A-009-MO.

Descriptors: *Chemical analysis, *Analytical techniques, *Trace elements, Spectrophotometry, Radioactivity techniques, Solubility, Laboratory tests, Chemistry, Color reactions, Indicators, Test procedures.
Identifiers: *Selenium analysis, Diaminobenzidine.

Radiometric and spectrophotometric procedures for selenium analysis were developed based on the formation and separation of the mono- and di-piazselenols of 3,3' -diaminobenzidine. Analysis of samples, reaction conditions, and sensitivity of the procedures are discussed. (Knapp-USGS)
W70-00460

DETERMINATION OF PHENOXY ACID HERBICIDES IN WATER BY ELECTRON-CAPTURE AND MICROCOULOMETRIC GAS CHROMATOGRAPHY,
Geological Survey, Washington, D.C.
Donald F. Goerlitz, and William L. Lamar.
Geol Surv Water-Supply Pap 1817-C, 1967. 21 p, 2 fig, 3 tab, 18 ref.

Descriptors: *Analytical techniques, *Herbicides, *Gas chromatography, Chemical analysis, Water analysis, Water chemistry.
Identifiers: Phenoxy acid herbicides, (2,4,5-T), (2,4-D), Silvex.

A sensitive gas chromatographic method using microcoulometric titration and electron-capture detection for the analysis of 2,4-D, silvex, 2,4,5-T, and other phenoxy acid herbicides in water is described. The herbicides are extracted from unfiltered water samples (800-1,000 ml) by use of ethyl ether, then the herbicides are concentrated and esterified. To allow the analyst a choice, two esterification procedures - using either boron trifluoride-methanol or diazomethane - are evaluated. Microcoulometric gas chromatography is specific for the detection of halogenated compounds such as the phenoxy acid herbicides whereas it does not respond to nonhalogenated components. The practical lower limits for measurement of the phenoxy acid herbicides in water primarily depend upon the sample size, interferences present, and instrumentation used. With 1-liter samples of water, the practical lower limits of measurement are 10 ppt for 2,4-D and 2 ppt for silvex and 2,4,5-T when electron-capture detection is used, and approximately 20 ppt for each herbicide when analyzed by microcoulometric-titration gas chromatography. Recoveries of the herbicides immediately after addition to unfiltered water samples averaged 92%-98%. 2,4-D may be rapidly degraded, especially if the samples are obtained from areas which have been repeatedly sprayed. (Knapp-USGS)
W70-00473

THE USE OF ARTIFICIAL SUBSTRATES IN POLLUTION SURVEYS,
Federal Water Pollution Control Administration, Duluth, Minn. National Water Quality Lab.
For primary bibliographic entry see Field 05B.
W70-00666

A NOTE ON THE DEPENDENCE BETWEEN THE CONCENTRATION OF CHLORIDE IONS AND THE RADIOACTIVITY OF EMANATION DISSOLVED IN MINERAL WATERS (IN POLISH),
Warsaw Univ. (Poland). Faculty of Geophysics.
Maria Rymaszewska.
Published in Polish with English summary. Acta Geophys Polonica, Warsaw, Vol 17, No 2, p 197-202, 1969. 6 p, 5 fig, 2 tab, 4 ref.

Descriptors: *Chemical analysis, *Radiochemical analysis, *Mineral water, *Ions, *Chlorides, Radioactivity, Water chemistry, Sodium, Potassium, Magnesium, Sulfates, Carbonates, Trace elements, Stations.
Identifiers: *Poland, Radioactive mineral waters.

Numerous samples of the radioactive mineral waters of Poland were analyzed for their contents of radon and other elements. Large concentrations of radon in the mineral waters of Poland are associated with very small concentrations of chloride ions. (Gabriel-USGS)
W70-00668

ENVIRONMENTAL SURVEILLANCE AROUND A NUCLEAR FUEL REPROCESSING INSTALLATION, 1965-1967,
New York State Dept. of Health, Albany. Bureau of Radiological Health.
For primary bibliographic entry see Field 05C.
W70-00677

MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,
Rocketdyne, Canoga Park, Calif. Research Div.
For primary bibliographic entry see Field 05B.
W70-00682

OIL POLLUTION OF THE SEA: DETECTION.

Harv Int L J, Vol 10, No 2, p 353-355, Spring 1969. 3 p, 4 ref.

Descriptors: *Water pollution sources, *Chemical analysis, *Oil, *Oceans, Organic compounds, Ships, Sampling, Water analysis, Measurement, Reliability, Testing.
Identifiers: *Detection, Identification, Enforcement.

Of extreme importance to the effective control of oil pollution of the sea is the problem of enforcement. The crucial issue is the matter of detecting the source of pollution. Visual surveillance is inadequate in view of the area to be policed and the rapidity with which an oil slick breaks up. To facilitate identification, some kind of system for the labeling of tanker cargo seems necessary. A tagging system has been proposed which would be reliable, nearly tamper proof, and feasible with today's technology. The system would require certain combinations of hydrocarbon compounds to be mixed with each oil cargo. Only a small, inexpensive amount would be required. Samples from discovered oil slicks would be sent to a central laboratory for analysis of the tagging compounds. With this system, the source of any oil discharge can be precisely identified. (See W70-00786). (Heckerling-Florida)
W70-00795

5B. Sources of Pollution

ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02L.
W70-00419

NITROGEN CONTAMINATION OF GROUNDWATER BY BARNYARD LEACHATES,
Guelph Univ. (Ontario). Dept. of Soil Science.
R. W. Gillham, and L. R. Webber.
J Water Pollut Contr Federation, Vol 41, No 10, p 1752-1762, Oct 1969. 11 p, 10 fig, 2 tab, 13 ref.

Descriptors: *Farm wastes, *Cattle, *Leaching, *Water pollution sources, Path of pollutants, Water pollution effects, Nutrients, Groundwater movement, Nitrogen, Waste water (Pollution).
Identifiers: Cattle wastes, Feedlot wastes.

A zone of nitrogen-contaminated groundwater associated with a barnyard was studied to determine the quantity of inorganic nitrogen reaching the groundwater from the barnyard. From piezometric potential and hydraulic conductivity measurements, quantitative flow nets were drawn permitting groundwater discharge calculations. An in-

crease from 2 to 15 mg/l inorganic nitrogen occurred in the groundwater as it passed beneath the barnyard. This resulted in a contribution of 4.4 lb (2.0 kg) of inorganic nitrogen made by the barnyard to the groundwater during the 5-month study period. The concentration of nitrogen was related to the direction of groundwater flow and was dependent on the presence of conditions suitable for the leaching of nitrogen and the dilution potential of the local groundwater flow system. The surface topography proved to be a poor indication of the direction of groundwater flow. (Knapp-USGS)
W70-00665

THE USE OF ARTIFICIAL SUBSTRATES IN POLLUTION SURVEYS,
Federal Water Pollution Control Administration, Duluth, Minn. National Water Quality Lab.
John W. Arthur, and William B. Horning, II.
The Amer Midland Natur, Vol 82, No 1, p 83-89, July 1969. 7 p, 2 fig, 3 tab, 6 ref.

Descriptors: *Bioindicators, *Water pollution effects, *Periphyton, Pollutants, Productivity, Aquatic productivity, Biomass, Ecology, Mapping, Mississippi River, Benthos, Water quality control, Sampling, Chemical analysis, Chlorophyll, Organic matter, Rivers, Biota, Habitats.
Identifiers: Minnesota River, Water pollution surveys.

Artificial substrates were constructed from pressed Masonite board and suspended in the Minnesota and Mississippi Rivers during the summer of 1965. The benthos recovered from the Mississippi River substrates reaffirmed the zones of water quality defined by results from conventional bottom sampling techniques, and analysis of chlorophyll-a indicated a progressive increase in periphyton crop below the major contributors of organic pollution. The numbers and kinds of benthic animals gathered from the Minnesota River substrates differed from results obtained from conventional bottom sampling methods, and suggest that the factor limiting river biota is a lack of suitable natural habitats rather than chemical quality. (Gabriel-USGS)
W70-00666

ENVIRONMENTAL SURVEILLANCE AROUND A NUCLEAR FUEL REPROCESSING INSTALLATION, 1965-1967,
New York State Dept. of Health, Albany. Bureau of Radiological Health.
For primary bibliographic entry see Field 05C.
W70-00677

A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
Arkansas State Dept. of Health, Little Rock. Div. of Radiological Health.
For primary bibliographic entry see Field 05G.
W70-00678

BIOCHEMICAL OXYGEN DEMAND AND DEGRADATION OF LIGNIN IN NATURAL WATERS,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Div. of Technical Services.
E. W. Raabe.
J Water Pollut Contr Federation, Vol 40, No 5, Part 2, p 145-150, May 1968. 6 p, 3 fig, 15 ref.

Descriptors: *Biochemical oxygen demand, *Oxygen, *Lignins, *Natural streams, Rivers, Carbohydrates, Wastes, Oxidation, Analytical techniques, Pulp wastes.
Identifiers: *Lignin degradation, Kraft mill wastes.

A study of the BOD and decomposition of lignin in natural waters showed that the BOD of a stream polluted with Kraft mill wastes is related to the concentration of carbohydrates, fraction of lignin compounds oxidizable in 100 days, and possibly to other slowly oxidizable organics. The fast component (k= 0.455) of the first stage of BOD represents oxidation of wood sugars and other readily decomposable meterials. The slow component of the first stage and the second stage (k= 0.072 and 0.080, respectively) represent decomposition of lignin and its by-products and other decomposable organics. Less than 50% of the lignin compounds were oxidizable under test conditions over a period of 100 days. (Carstea-USGS)
W70-00681

MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,
Rocketdyne, Canoga Park, Calif. Research Div.
I. Lysji, Kurt H. Nelson, and P. R. Newton.
J Water Pollut Contr Federation, Vol 40, No 5, Part 2, p 181-187, May 1968. 7 p, 3 fig, 4 tab, 11 ref. Office of Saline Water, Contract No 14-01-0001-332.

Descriptors: *Monitoring, *Industrial wastes, *Pollutants, *Methane, Analytical techniques, Instrumentation, Gas chromatography, Detergents, Organic compounds, Water pollution control, Water quality.
Identifiers: *Pyrolysis-methane method, Hydrocarbons, Alkyl-type carbons.

Industrial pollutants containing methylene and methyl groups in their molecular structures can be monitored by pyrolytic conversion to methane without prior separation from the water. The method is based on the fact that many industrial pollutants have far higher contents of methyl and methylene groups than do natural organics. Pyrolysis is carried out at 600 deg C. A porous glass column separates the methane from the other pyrolytic products and the water vapor for subsequent measurement with a hydrogen flame ionization detector. Rapidity of analysis and high sensitivity are the major advantages of the method. (Carstea-USGS)
W70-00682

EFFECT OF PHOTOSYNTHESIS ON OXYGEN SATURATION,
Technical School, Nis (Yugoslavia).
For primary bibliographic entry see Field 05C.
W70-00683

TRITIUM IN THE ENVIRONMENT FROM NUCLEAR POWERPLANTS,
Bureau of Radiological Health, Rockville, Md.
Charles L. Weaver, Ernest D. Harward, and Harold T. Peterson, Jr.
US Dep of Health, Education, and Welfare, Public Health Reports, Vol 84, No 4, p 363-371, 1969. 1 fig, 5 tab, 12 ref.

Descriptors: *Tritium, *Environment, *Nuclear powerplants, Fallout, Public health, Radioactivity, Oxygen, Nitrogen, Nuclear explosions, Precipitation (Atmospheric), Boron, Deuterium, Electricity, Heavy water, Activation energy, Ammonia, Coolants, Irradiation, Condensation, Liquid wastes, Monitoring, Sampling, Water pollution sources.
Identifiers: Contaminant, Radioactive half-life, Beta particle, Neutrino, Cosmic radiation, Fissioning uranium, Lithium, Control rods, Neutron capture, Cladding material, Zirconium, Plutonium, Reactors, Production rates, Bureau of Radiological Health, Air ejector, Gaseous tritium, Tritiated water, Liquid scintillation counting, Southwestern Radiological Health Laboratory.

Because of its continued production and long half-life, tritium, one of the least hazardous radioactive nuclides, may increase in the environment; as tritiated water, it can be incorporated into body fluids and tissues. This paper is intended to be an information guide for public health agencies. Measurable levels of environmental tritium already prevail from the greatest single source--testing of nuclear weapons. Future tritium releases from reactors and spent fuel processing plants may increase that quantity. The mechanisms whereby tritium may be produced are influenced by reactor type, operating history, design characteristics, and construction materials. Most tritium is released as tritiated water in liquid radioactive waste, usually much less than 1% of the discharge limit specified by the Code of Federal Regulations. Since tritium is not detectable by conventional methods of gross radioactivity analysis, special analytical techniques are required. Analytical results from ten locations indicated, with one exception, that waters downstream from nuclear facilities were not significantly higher in tritium concentrations than stream waters without operating nuclear reactors. Estimates of tritium from nuclear power facilities projected for year 2000, constitute about 5% of maximum tritium activity prevailing in 1963. Tritium releases from operating power reactors are not presently dangerous to health. (Jones-Wisconsin)
W70-00716

BACTERIOLOGICAL EFFECT OF SMALL BOAT WASTES ON SMALL HARBORS,
Washington Univ., Seattle.
For primary bibliographic entry see Field 05C.
W70-00722

CONTRIBUTION OF PHOTOSYNTHETIC REAERATION TO TOTAL REAERATION OF THE PASSAIC RIVER,
Thomas J. Tuffey, and Joseph V. Hunter.
Available from ASME, 345 East 47th St, New York, NY, 10017, for $1.50 per copy, $0.75 to ASME members. Paper presented at American Society of Mechanical Engineers, American Institute Chemical Engineers Stream Pollution and Abatement Conference, June 1969. American Society Mechanical Engineers Publication 69-PID-11. 12 p, 5 fig, 5 tab, 39 ref.

Descriptors: *Photosynthesis, Oxygen demand, Dissolved oxygen, Oxygen sag, Biochemical oxygen demand, Aeration.
Identifiers: Natural aeration, Atmospheric reaeration.

Oxygen balance studies have for many years been one of the major areas of stream sanitation research. In order to better understand oxygen relationships and to accomplish the task of maintaining sufficient oxygen levels in streams, mathematical models and abstractions are essential. Through such investigations, allowable pollutional loads may be evaluated and this information utilized by sewage treatment facilities in populated areas. On the Passaic River, studies were made to evaluate the photosynthetic reaeration in terms of flow conditions, depth, and percent of total reaeration. (Whipple-Rutgers)
W70-00731

AN EXPERIMENTAL RESEARCH OF COEFFICIENT OF LONGITUDINAL DISPERSION FOR SMALL RIVERS (IN RUSSIAN),
Tallinn Polytechnic Inst. (USSR).
H. Velner, L. Paal, and L. Rohusaar.
Sbornik statei po sanitarnoi technike V, Trudy Talinskogo Politekchnicheskogo instituta, Tallin, ESSR, Seria A, p 462-485, Ho 248, 1967.

Descriptors: *Dispersion, *Flow characteristics, Water pollution, Water pollution effects, Mixing, Diffusion, Conducting, Streams, Turbulence.
Identifiers: Longitudinal mixing coefficient.

This work deals with the results of an experimental research of the longitudinal dispersion coefficient for small streams. The coefficient has been determined by experimental means using common salt (NaCl) and measuring electrical conductivity of water. The coefficient of longitudinal dispersion has been calculated: (1) according to the data of maximum concentration of the cloud of pollutant, and (2) according to the change of variance of the cloud of pollutant along the river. The following

has been established: (1) determining the coefficient of longitudinal dispersion by the method of maximum concentrations, as proposed, given reliable results; (2) the coefficient of longitudinal dispersion for small rivers, according to experimental data of the authors, has the magnitude of 0.2 - 1.5 m sq/sec; (3) the coefficient of longitudinal dispersion D for small rivers can be determined with a sufficient accuracy (sigma= plus or minus 20%) as D= 1.5 mu B, where mu is the mean velocity of the stream and B is the width of the stream. (Novotny-Vanderbilt)
W70-00743

OIL POLLUTION OF THE SEA.
For primary bibliographic entry see Field 05G.
W70-00786

OIL POLLUTION AND THE SEA: THE SOURCES OF POLLUTION.

Harv Int L J, Vol 10, No 2, p 316-320, Spring 1969. 5 p, 30 ref.

Descriptors: *Water pollution sources, *Oil, *Ships, Transportation, Natural resources, Oil industry, Accidents, Oceans, Sea water, Cleaning, Oily water, Oil wells, Wastes, Chemical wastes.
Identifiers: *Tankers, *Oil pollution, Ballast, Seeps.

The problem of oil pollution actually began in the early part of the 20th century when naval and merchantile vessels began using fuel oil in place of coal. About the same time, the increased demand for oil for use on land required the importation of large quantities by ship. Each year the number and size of oil tankers has increased to meet this demand. While the discharge of oil by tankers is most publicized during a spectacular disaster like the recent 'Torrey Canyon' incident, the largest portion of oil pollution results from the ballasting and cleaning of ships. The large numbers of tankers and their numerous voyages combine to represent a large source of pollution. Another source is submarine oil wells which occasionally leak. A small amount of oil also comes from shipping sunk during World War II. Finally natural sources contribute some oil each year. (See W70-00786). (Heckerling-Florida)
W70-00787

OIL POLLUTION OF THE SEA: DETECTION.
For primary bibliographic entry see Field 05A.
W70-00795

5C. Effects of Pollution

ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02L.
W70-00419

THE USE OF INVERTEBRATES IN A WATER QUALITY INVESTIGATION: A BIOLOGICAL STUDY OF THE MIAMI RIVER, OHIO,
Stanford Univ., Calif. Dept. of Civil Engineering
P. Jonathan Young.
Proc 3rd Annu Amer Water Resources Conf, Nov 8-10, 1967, San Francisco, Calif, p 304-313, 1967. 10 p, 2 fig, 2 tab, 7 ref.

Descriptors: *Water pollution effects, *Bioindicators, *Water quality, *Dissolved oxygen, *Ohio, Water temperature, Sludge worms, Bloodworms, Aquatic bacteria, Algae, Mayflies, Caddisflies.
Identifiers: Great Miami River (Ohio).

A biological study was made of the Great Miami River, Ohio to determine the factors causing variations in aquatic life. Sampling sites were chosen to vary as little as possible in all characteristics except water quality. The variety of life was most related to dissolved oxygen, and water temperature was the next most important factor. The water pollution conditions were divided into 4 zones. Very polluted: Here, bacteria and protozoans are abundant. Only a few species of animals exist (sludge worms, blood worms, and maggots) and these live on decaying matter or bacteria. Green plants are usually absent. Sewage fungus may occur. Polluted: Bacteria are still abundant and oxygen is low. Green algae begin to appear and bloom, and some of the more tolerant invertebrates and rooted plants are found. Semi-healthy: Algae blooms have usually disappeared. Most of the polluted-favoring organisms are decreasing in abundance while less tolerant species begin to appear. Dissolved oxygen may average 5 ppm or more. Healthy: The animal and plant life is more or less normal. Decomposition continues at a much reduced rate. Dissolved oxygen is high and approaches saturation values. Three insects were chosen to separate the classification zones. The larva of the damselfly Ishnura was chosen to separate 'poluted' from 'very polluted.' The larva of the mayfly Baetis was chosen to separate 'semi-healthy' from 'polluted'; and the caddis fly larva Hydropsyche was chosen to signify the beginning of the 'healthy' zone. Along the Great Miami River, the progression of these invertegrates was found to be very consistent. (Knapp-USGS)
W70-00475

WATER QUALITY OBJECTIVES,
For primary bibliographic entry see Field 06B.
W70-00506

SEWAGE FUNGUS: ITS NATURE AND EFFECTS,
Water Pollution Research Lab., Stevenage (England).
E. J. C. Curtis.
Water Research, Vol 3, No 5, p 289-311, May 1969. 23 p, 9 fig, 1 tab, 132 ref.

Descriptors: *Fungi, *Sewage effluents, *Water pollution, Bioindicators, Bacteria, Protozoa, Water quality control, Dissolved oxygen, Hydrogen ion concentration, Streams, Organic compounds.
Identifiers: *Sewage fungus, Physiological ecology.

An extensive literature dealing with sewage fungus is reviewed. This fungus is a sensitive indicator of organic pollution in water. Sewage fungus comprises a community of bacteria, fungi, and protozoa which are normal inhabitants of rivers and form macroscopic slimes only in polluted water. Illustrations are included for 10 common sewage fungus organisms. The ecology, physiology, and nutrition of the most common organisms are described. The most widespread organisms in sewage fungus are the filamontous bacteria; Sphaerotilus natans received special attention. Taxonomy, morphology, and mineral requirements are discussed and the effects of flow, effects of temperature, effects of pH value, and effects of dissolved oxygen concentration are described. Sewage fungus is likely to develop in places with organic pollution, especially in effluents containing organic nutrients of low molecular weight. The only efficient know method to prevent the growth of sewage fungus is the removal of the nutrients before the effluents are discharged. (Carstea-USGS)
W70-00637

CHEMICAL INTERACTIONS OF WASTEWATER IN A SOIL ENVIRONMENT,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
For primary bibliographic entry see Field 05D.
W70-00658

BACTERIA, CARBON DIOXIDE, AND ALGAL BLOOMS,
Wyandotte Chemical Corp., Mich.
L. F. Kuentzel.
J Water Pollut Contr Federation, Vol 41, No 10, p 1737-1747, Oct 1969. 11 p, 51 ref.

Descriptors: *Eutrophication, *Algae, *Nutrients, *Carbon dioxide, *Reviews, Bibliographies, Bacteria, Decomposing organic matter, Waste water (Pollution).
Identifiers: Algal blooms.

A recent literature survey on the subject of lake eutrophication, and algal blooms and nutrients as causative factors, reveals that there is a decided lack of published information on the role of the major nutrient, carbon dioxide. Great emphasis is placed on phosphorus and nitrogen as causative agents in the production of unwanted algal growths, yet a satisfactory accounting for the source of the tremendous amounts of carbon dioxide required for massive algal blooms has not been found in the literature. The purposes of this paper are (a) to provide some logistics on carbon dioxide requirements for such blooms, (b) to establish the fact that such quantities of carbon dioxide are not available from the atmosphere and dissolved salts, and (c) to point out the role played by bacteria and decomposable organic matter. (Knapp-USGS)
W70-00664

NITROGEN CONTAMINATION OF GROUNDWATER BY BARNYARD LEACHATES,
Guelph Univ. (Ontario). Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W70-00665

ECOLOGICAL FACTORS AND THE DISTRIBUTION OF CLADOPHORA GLOMERATA IN THE GREAT LAKES,
Wisconsin Univ., Milwaukee. Dept. of Botany.
Richard P. Herbst.
The Amer Midland Natur, Vol 82, No 1, p 90-98, July 1969. 9 p, 3 fig, 1 tab, 15 ref.

Descriptors: *Ecology, *Eutrophication, *Great Lakes, *Algae, Nutrients, Phosphorus, Population, Pollutants, Mapping, Hydrogen sulfide, Cities, Lake Huron, Lake Erie, Lake Ontario, Lake Michigan, Water temperature, Phosphates, Turbidity.
Identifiers: Cladophora glomerata.

Nutrient enrichment in the Great Lakes has provided fertile areas for growth of algal nuisances. One of these species, Cladophora glomerata, has become a major problem for many cities bordering the Great Lakes. Ecological factors concerning its growth in Milwaukee's Harbor were studied, and its distribution in the Great Lakes determined. Phosphorus levels appear to be closely linked with Cladophora increases. (Gabriel-USGS)
W70-00667

ENVIRONMENTAL SURVEILLANCE AROUND A NUCLEAR FUEL REPROCESSING INSTALLATION, 1965-1967,
New York State Dept. of Health, Albany. Bureau of Radiological Health.
William J. Kelleher.
Radiol Health Data and Rep, Vol 10, No 8, p 329-339, Aug 1969. 11 p, 4 fig, 11 tab, 9 ref.

Descriptors: *Environmental effects, *Radioactive wastes, *Nuclear power plants, *Monitoring, Streams, Milk, Watersheds (Basins), Silts, Fish, Deer, Iodine radioisotopes, Public health, Radioactivity, Strontium radioisotopes, Cesium.
Identifiers: *Environmental surveillance, Liquid wastes, Health hazards, Nuclear fuel reprocessing plants.

A summary report of environmental surveillance around the Ashford, N.Y. nuclear fuel reprocessing plant is presented. This report includes data obtained before and after the plant began operations in April 1966. Media monitored included air and milk supplies in the surrounding area; liquid wastes; local watersheds and streams; silt, deer, and fish in the plant perimeter area. Data obtained through 1967 indicate that the discharges from the plant stack have not produced environmental effects from particulate beta-particle emitters or iodine-

131 that might constitute a public health hazard. Surveillance of the streams showed greater concentrations of strontium-90 during the fall and winter of 1966-1967 than in the latter part of 1967. Silt removed more cesium-137 than strontium-90; most of the latter was in the dissolved state. The ratio of cesium-137 to cesium-134 (cesium-134 is indicative of spent fuel) in the wastes was about 4 or 5 to 1. The levels of radioactivity in deer and fish were sufficiently high to require careful evaluation of the public health significance. (Carstea-USGS)
W70-00677

EFFECT OF PHOTOSYNTHESIS ON OXYGEN SATURATION,
Technical School, Nis (Yugoslavia).
Lazar R. Ignjatovic.
J Water Pollut Contr Federation, Vol 40, No 5, Part 2, p 151-161, May 1968. 11 p, 3 fig, 2 tab, 9 ref.

Descriptors: *Photosynthesis, *Oxygen, *Saturation, Temperature, Pressure, Mixing, Evaporation, Supersaturation, Reservoirs, Algae, Bodies of water, Dissolved oxygen, North Carolina.
Identifiers: *Oxygen supersaturation, Vertical mixing, Roanoke Rapids Reservoir (NC).

Temperature changes, pressure changes, vertical mixing of stratified water, and evaporation are discussed and evaluated in order to clarify the phenomenon of oxygen supersaturation in natural bodies of water. Data from Roanoke Rapids Reservoir in North Carolina were used. Supersaturation with dissolved oxygen may be an high as 25% at a 5 ft depth and at an average temperature of 25 deg C. These changes cannot account for observed supersaturation. Some significance to the supersaturation is attached to the effects of sunshine and algal growth. Photosynthesis is the only force capable of producing the supersaturation of such a magnitude. (Carstea-USGS)
W70-00683

GROWTH AND RESISTANCE TO STRESS IN BROOK TROUT FED SUBLETHAL LEVELS OF DDT,
New Hampshire Univ., Durham. Dept. of Zoology.
Kenneth J. Macek.
J Fish Res Board of Canada, Vol 25, No 11, p 2443-2451, 1968. 9 p, 1 fig, 2 tab, 16 ref.OWRR Proj B-001-NH.

Descriptors: *Pesticide toxicity, *Brook trout, *DDT, Fishkill, Morbidity, Mortality, Water pollution effects, Water temperature, Water quality, Nutrients, Fish diets, Nutrient requirements.
Identifiers: DDT tolerance (Trout).

When underyearling brook trout were fed DDT at a rate of 2.0 mg/kg per week for 31 weeks, they exhibited greater weight gain (43.2 g) during the period than did untreated fish (36.6 g). When underyearling fish were fed DDT at different rates for 26 weeks and then starved or fed at a rate equivalent to 10% of the usual feeding rate, the cumulative mortality during this period was 96.2% among fish exposed to 3.0 mg/kg per week, 88.6% among fish exposed to 2.0 mg/kg per week, and 1.2% among untreated fish. Differences in the length of survival of DDT-exposed fish occurred due to dosage, sex, and type of starvation. The evidence suggests that the mortality of DDT-exposed fish was due to the interaction of DDT residues with a combination of environmental stresses, including starvation, decreasing water temperature, and possibly the physiological stress associated with the spawning season. (Knapp-USGS)
W70-00684

THE UPTAKE, ACCUMULATION AND EXCHANGE OF STRONTIUM-90 BY OPEN SEA PHYTOPLANKTON,
Miami Univ., Fla. Inst. of Marine Science.
E. F. Corcoran, and J. F. Kimball, Jr.
Proc 1st Nat Symp on Radioecology, Colorado State Univ, Ft Collins, Sept 10-15, 1961. Radioecology, Reinhold Pub Corp, N Y and Amer Institute of Biological Sciences, Washington, D C, Schultz, Vincent and Klement Alfred W Jr (Eds), p 187-191, 1963. 5 fig, 4 tab, 7 ref.

Descriptors: *Strontium radioisotopes, *Phytoplankton, Radioactivity, Waste disposal, Nuclear reactors, Powerplants, Ships, Submarines, Effluents, Ion exchange, Resins, Leakage, Cesium, Nuclear explosions, Absorption, Adsorption, Atlantic Ocean, Diatoms, Neritic algae, Ions, Water pollution effects, Water pollution sources, Radioecology.
Identifiers: *Radionuclide uptake, *Radionuclide accumulation, *Radionuclide exchange, *Open sea, Weapons testing, Nuclear Ship Savannah, Zirconium-95, Rubidium-106, Niobium-95, Gymnodinium simplex, Flagellates, Eleuthera Island, Nitzchia seriata, Navicula, Florida current, Yttrium-90, Katodinium rotundata.

Authors used five cultures of oceanic phytoplankton to determine their ability to concentrate strontium (Sr) from sea water, with the objective of ascertaining whether results of studies with neritic and freshwater forms can apply to neritic organisms. The experiments were short-termed, and were conducted during active growth phases to eliminate possibility of nutrient deficiencies and over-population, to minimize bacterial interference, and to emulate natural conditions as closely as possible. All cells grown in media containing strontium-90-yttrium-90 became radioactive. Uptake of Sr was proportional to the concentration of Sr in the medium, cells being able to concentrate radioactive Sr from 18.6 to 381.7 times its ambient concentration. Cell growth, in media containing up to ten times normal concentration of Sr, was not inhibited. Media containing high concentrations of Sr had little effect on ability of cells to accumulate Sr-90. Adsorption was found to play an important role in accumulation of Sr-90. While these results are preliminary, it should be noted that primary producers in marine environments can accumulate Sr-90 from sea water. Controlled laboratory experiments have the advantage of allowing comparisons between various phytoplankters and radionuclides. (See Vol. 2, No. 19, W69-07863.) (Jones-Wisconsin)
W70-00707

THE ROLE OF PHYTOPLANKTON IN THE CYCLING OF RADIONUCLIDES IN THE MARINE ENVIRONMENT,
Bureau of Commercial Fisheries, Beaufort, N.C.
T. R. Rice.
Proc 1st Nat Symp on Radioecology, Colorado State Univ, Fort Collins, Sept 10-15, 1961. Radioecology, Reinhold Pub Corp, N Y and Amer Institute of Biological Sciences, Washington, D C, Schultz, Vincent and Klement, Alfred W Jr (Eds). p 179-185, 1963. 5 fig, 8 tab, 23 ref.

Descriptors: *Phytoplankton, *Cycling, *Radioisotopes, Sea Water, Food chains, Phosphorus radioisotopes, Cobalt radioisotopes, Uranium radioisotopes, Nuclear explosions, Strontium radioisotopes, Cesium, Physicochemical properties, Adsorption, Colloids, Zinc radioisotopes, Calcium, Potassium, Clams, Size, Algae, Diatoms, Trace elements, Metabolism, Ions, Chlorella, Water pollution effects, Water pollution sources, Niches, Radioecology.
Identifiers: *Marine environment, Cerium-144, Nitzschia closerium, Artemia, Carteria, North Temperate Zone, Plutonium, Half-life (Radionuclide), Filter-feeding animals, Ruthenium-106, Platymonas, Thalassiosira, Amphidinium klebsi, Porphyridium cruentum, Radionuclide uptake, Nannochloris, Thoracomonas, Yttrium, 'Biological dilution', Physiological condition, Mercenaria mercenaria.

The importance of phytoplankton in cycling radionuclides in oceans depends upon number and concentration of radionuclides accumulated, length of time they are retained by the phytoplankton, size of phytoplankton cells, numbers of cells present in the water, and efficiency of digestion of phytoplankters by filter-feeding animals. The availability of a radionuclide in sea water depends largely upon its physical state (colloidal or particulate) as well as its ionic state. Accumulation is dependent on amounts of the element present in sea water and the quantities of other metabolically similar elements. Binary fission of radioactive phytoplankters in nonactive water results in 50% reduction of activity per cells with each division, termed as 'biological dilution.' Different species of phytoplankton, which accumulate a radionuclide to the same level and are removed from the water with the same efficiency by a filter-feeding animal, may not result in the animal's becoming equally radioactive, for all species of phytoplankton are not digested with equal efficiency. Brine shrimp (Artemia) concentrate radiocobalt to higher levels fed upon radioactive Carteria cells, than when radioactivity is derived from the water. (See Vol. 2, No. 19, W69-07863.) (Jones-Wisconsin)
W70-00708

POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
California Univ., Berkeley. Marine Resources Inst.; California Univ., Davis. Dept. of Zoology; Cornell Univ., Ithaca, N.Y. Div. of Ecology and Systematics; and San Diego Natural History Museum, Calif.
R. W. Risebrough, P. Reiche, D. B. Peakall, S. G. Herman, and M. N. Kirven.
Nature, Vol 220, No 5172, p 1098-1102, Dec 1968. 1 fig, 4 tab, 42 ref.

Descriptors: *Ecosystems, *Water pollution effects, Insecticides, Birds, Enzymes, Reproduction, Chlorinated hydrocarbon pesticides, Canal Zone, DDT, Peregrine falcon, Mexico, Fishes, Gas chromatography, Mass spectrometry, Pacific Ocean, Dieldrin, Antarctic, California, Conservation, Toxicity, Endrin, Colorado River, Mammals, Water pollution sources.
Identifiers: *Polychlorinated biphenylas, *Pesticides, Enzyme induction, Biocides, Calcium metabolism, Reproductive metabolism, p-p' -DDE, Steroid metabolism, Dohrman microcoulometric detector, DDE, Toxaphene, Fat metabolism, Eggshell thickness, Environmental quality, Hawks, Owls, San Francisco Bay, Gulf of Panama, Farallon Island, Baja California (Mexico), Puget Sound, Panama City (Panama), San Diego Bay, Estradiol metabolism.

Authors present extensive tabular data pertaining to the following subjects: chlorinated hydrocarbons in North American peregrine falcons; DDT and polychlorinated biphenyls (PCB) in prey species of peregrine falcons in the Gulf of California; PCB and DDT in the global ecosystem (including species of birds, mammals, and fishes); and increase in oestradiol metabolism in liver homogenates from pigeons treated with various chlorinated hydrocarbons. Analysis of these data indicates that PCB, powerful inducers of hepatic enzymes which degrade oestradiol, are widely dispersed in the global ecosystem. Together with other chlorinated biocides, including DDT, they could account in large measure for aberrations in calcium metabolism observed in many birds after World War II. Authors point out that the relatively small amounts of chlorinated hydrocarbons required to effect changes in reproductive metabolism make those approaches to pollutional ecology based on toxicity data in order of magnitude of parts per million irrelevant. (Eichhorn-Wisconsin)
W70-00709

EFFECTS OF TOXICANTS ON COMMUNITY METABOLISM IN POOLS,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga.
Walter R. Whitworth, and Thomas H. Lane.
Limnology and Oceanography, Vol 14, No 1, p 53-58, 1969. 2 fig, 2 tab, 6 ref.

Descriptors: *Antimycin A, *DDT, *Diquat, Bullheads, Sunfishes, Plankton.
Identifiers: *Community metabolism, *Community respiration, Bluegills, Diel oxygen techniques.

Rates of community metabolism are estimated to test the efficacy of a diel oxygen technique in providing indices of acute and chronic effects of toxicants. Thirty-eight experimental communities were exposed to concentrations (in milligrams/liter) of 0.02 p,p'-DDT (1,1,1-trichloro-2,2 bis (p-chloropenyl) ethane); 0.1 antimycin A; 9.2 potassium permanganate; 0.9 and 2.6 formalin; 10.0 nigrosine black; 2.0 and 10.0 malachite green; 0.1 Diquat and 0.5 and 5.0 copper sulfate. Dissolved oxygen was measured with an oxygen electrode; nutrients were added to bring all pools to a total hardness of 100 milligrams/liter. Results indicate that DDT, antimycin A and potassium permanganate had no adverse effects on community respiration, although DDT and antimycin A were lethal to some plankton and several species of fish (Centrarchidae, Cyprinidae, Ictaluridae). The remaining toxicants usually depressed community oxygen production and increased community respiration for periods of 1 to 20 weeks. The method used is an effective and economical bioassay. Tabular data include sample computations and acute effects of toxicants; oxygen metabolism data are presented graphically. (Voigtlander-Wisconsin)
W70-00710

OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
Nevada Fish and Game Dept., Reno; and California State Dept. of Fish and Game, Sacramento. Inland Fisheries Branch.
For primary bibliographic entry see Field 02H.
W70-00711

VERTICAL DISTRIBUTION OF PHOSPHORUS IN LINSLEY POND MUD,
Duke Univ., Durham N.C. Dept. of Zoology.
For primary bibliographic entry see Field 02H.
W70-00712

SEASONAL SELECTION OF ESTUARINE BACTERIA BY WATER TEMPERATURE,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
John McN Sieburth.
Journal Experimental Marine Biology and Ecology, Vol 1, p 98-121, 1967. 11 fig, 4 tab, 39 ref.

Descriptors: *Bacteria, *Estuarine environment, *Water temperature, *Seasonal, Rhode Island, Sampling, Ecology, Ammonia, Enzymes, Classification, Growth rates, Seawater, Incubation, Pseudomonas, Subsurface-waters, Bottom sediments, Surface waters, Detritus, Light intensity, Turbidity, Algae, Diatoms, Cycling nutrients, Physiological ecology, Water pollution effects, Phytoplankton.
Identifiers: Narragansett Bay (Rhode Island), Taxonomic types, Heteretrophy, Bacterial medium, Arthrobacter, Flora, Ambient temperature, Thermal sensitivity, Genera, 'Flavobacterium-cytophaga', Vibrios, Achromobacters, Gram-positive bacteria, Sarcine-like, Bacillus-like, Micrococcus-like, Psychrophiles, Plemorphic, Myceloid, Coryneform rods, Cocci, Arthrospores, Gram-negative bacteria, Colony development.

Heteretrophic planktonic bacteria were observed in temperature Narragansett Bay, Rhode Island, to establish whether seasonal water temperature changes are sufficient to select thermal and taxonomic types. Population changes were examined in semi-monthly samples and genera determined for 2500+ isolates; growth-temperature spectra of 600 representative isolates at 20 temperatures, 2C (C= degrees Celsius) apart, were examined. Growth range of natural bacterial populations varied with water temperature. All thermal types were isolated and population trends observed. Mesophilic isolates (growth above 10C; optimum have above 30C) were only obtained on plates at 36C when water temperature exceeded 10C. Several mesophiles were cold-sensitive and labile below 18C. Obligate psychrophiles (growth below 16-20C; optimum 9-10C) were only obtained on 0C plates where water temperatures were below 10C. Two additional thermal types were obtained on both 0 and 18C plates. Organisms which grew at 0C (optimum 10-30C) were considered facultative psychrophiles; those which grew at 0C (narrower optimum, 18-20C), psychrotolerant. Besides these major thermal types, a few isolates of several taxonomic groups exhibited tendency for multiple temperature optima. Seasonal selection of thermal types of water temperature occurred in all taxonomic groupings. (Jones-Wisconsin)
W70-00713

ACCUMULATION OF DIELDRIN BY FISH AND SELECTED FISH-FOOD ORGANISMS,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
George G. Chadwick, and Robert W. Brocksen.
Journal of Wildlife Management, Vol 33, No 3, p 693-700, July 1969. 8 fig, 14 ref.

Descriptors: *Dieldrin, *Laboratory tests, *Sculpins, *Tubificids, Bioassay, Midges, Pesticide residues, Water pollution effects.
Identifiers: *HEOD, Cottus preplexus, Tubifiex, Chironomidae, Insecticide retention.

Accumulation rates of a component of dieldrin--1, 2, 3, 4, 10, 10-hexachloro-6, 7-epoxy-1, 4, 4a, 5, 6, 7, 8, 8a-octahydro-1, 4-endo, exo-5, 8-dimethanonaphthalene (HEOD)--from water and food by fish (sculpin) and fish-food organisms (tubificids and midge larvae) were determined under laboratory conditions. Dieldrin was introduced into test aquaria by percolating water through a column of inert material coated with the insecticide. Accumulation and retention of dieldrin was determined by gas-liquid chromatographic analysis for HEOD. Sculpins kept at 15 deg C were exposed to five concentrations of HEOD ranging from 0.017 to 8.60 parts per billion (ppb). Fish were fed a daily maintenance ration (3% of their wet weight) of uncontaminated tubificid worms. Uptake and storage of HEOD at a given concentration is a function of time; accumulation occurred at a nearly constant rate at each concentration, with no evidence of saturation within the exposure period (32 days). Tubificid worms exposed to 80 ppb HEOD (a toxic concentration for fish) had accumulated 365 parts per million (ppm) HEOD at 32 days. Worms containing 150 ppm HEOD retained 62 ppm after 16 days in uncontaminated water. Fish retained lower proportions of available HEOD when their food consumption was greater. Authors conclude that 16% of accumulated HEOD at 21 days was maximum attributable to contaminated food. (Voightlander-Wisconsin)
W70-00714

EFFECTS OF FERTILIZERS ON WATER QUALITY.
Tennessee Valley Authority, Muscle Shoals, Ala. Soils and Fertilizer Research Branch.

National Fertilizer Development Center, Tennessee Valley Authority, Muscle Shoals, Alabama, 1969. 107 p, 141 ref. J M Soileau (compiler).

Descriptors: *Abstracts, *Agricultural watersheds, *Fertilizers, *Water quality, Nitrogen, Phosphorus, Potassium, Tennessee Valley Authority Project, Water balance, Eutrophication, Cycling nutrients.
Identifiers: *Nutrient cycles, Nutrient losses.

Report includes a compilation of 701 abstracts plus 141 supplemental references. Abstracts are classified under the general headings of: Problem Identification and Introduction; Natural Nutrient Cycles (N (nitrogen), P (phosphorus), K (potassium)) in the Exosystem; Water Volumes; Fertilizer Use on Agricultural Lands in the United States; Nonwater Pathways of Fertilizer Nutrients (N,P,K) Added to Soils; Losses of Fertilizer Nutrients (N,P,K) Through Water Pathways; and, Other Sources of Water Pollution. Abstracts are cross-indexed where appropriate. Author, geographical, and soils indexes are provided. (Voightlander-Wisconsin)
W70-00717

PESTICIDES AND FISHES--A REVIEW OF SELECTED LITERATURE,
Arizona State Univ., Tempe. Dept. of Zoology.
Donald W. Johnson.
Transactions of the American Fisheries Society, Vol 97, No 4, p 398-424, Oct 1968. 5 tab, 156 ref.

Descriptors: *Fishes, *Pesticides, *Reviews, *Bibliographies, Chlorinated hydrocarbon pesticides, Carbamate pesticides, Organophosphorus pesticides, Inorganic pesticides, Herbicides.
Identifiers: *Literature review.

Author presents a literature review and critique of research to date on pesticide interactions in aquatic habitats. Thirty-four pesticides are considered, with special emphasis being placed on their effects on freshwater and marine fishes; author stresses importance of ascertaining the physical and biological factors that affect toxicity. Data are discussed in terms of mean lethal concentrations--concentrations lethal to 50% of the fish. Literature is reviewed under the general headings: factors affecting toxicity; pesticide residues; effects of pesticides on and in aquatic food chain; action of pesticides on fishes; and pesticide analysis. Field studies have lagged behind laboratory studies and very little work has been done on pesticide effects on invertebrate populations. The need for studies of ecological and physiological effects of sublethal quantities is stressed, in order that realistic tolerance limits of toxic pollutants may be established. (Voigtlander-Wisconsin)
W70-00718

THE ISOLATION, PURIFICATION, AND NUTRIENT SOLUTION REQUIREMENTS OF BLUE-GREEN ALGAE,
Wisconsin Univ., Madison. Dept. of Botany.
Gerald C. Gerloff, George P. Fitzgerald, and Folke Skoog.
IN Symposium on the Culturing of Algae, Charles F. Kettering Foundation, Dayton, Ohio, p 27-44, 1950. 6 tab.

Descriptors: *Isolation, *Cyanophytes, *Nutrient requirements, Cultures, Lakes, Algae, Growth rates, Bacteria, Ultraviolet radiation, Actinomycetes, Hydrogen ion concentration, Nitrates, Potassium, Calcium, Magnesium, Iron, Organic matter, Nitrogen fixation, Volume, Streams, Water pollution effects, Eutrophication, Nuisance algae.
Identifiers: *Purification, Culture media, Microcystis aeruginosa, Aphanizomenon flos-aquae, Gloeotrichia echinulata, Coccochloris Peniocystis, Madison (Wis), Chicago Natural History Museum, Nostoc muscorun, Nutrient concentration, Wisconsin, Sulfur, Phosphorus.

Procedures and progress are described in isolating and culturing representative cyanophytes (blue-green algae) and making them bacteria-free. Each species isolated was designated as a permanent specimen in Chicago Natural History Museum collection. Coccochloris Peniocystis requires an unusually high pH for maximum growth. Systematic concentration variation of one element at a time of the basic culture solution showed that higher nitrate concentrations were solely responsible for increased growth. Relationship of phosphorus, sulfur, potassium, magnesium, calcium, and iron were tested. The demonstration indicates that 24 species of cyanophytes can be cultured continuously in inorganic solutions of known composition, evidences strongly that, as a group, they do not require organic substances or unknown factors for normal growth. It appears that nitrogen supply is an important factor in their growth under natural conditions. Coccochloris Peniocystis apparently does not fix atmospheric nitrogen. The

laboratory data probably cannot be applied directly to field conditions since concentrations of essential elements as well as volumes of solution from which algae extract them, are certainly important. Nevertheless, laboratory data should help considerably in determining requirements for optimum growth of cyanophytes in lakes and streams. (Jones-Wisconsin)
W70-00719

BACTERIOLOGICAL EFFECT OF SMALL BOAT WASTES ON SMALL HARBORS,
Washington Univ., Seattle.
Robert W. Seabloom.
Available from the Clearinghouse as PB-187 270, $3.00 in paper copy, $0.65 in microfiche. Completion Report, Washington Water Research Center, July 1969. 20 p, 5 fig, 4 tab, 13 ref. OWRR Project A-024-WASH.

Descriptors: *Boat wastes, *Water pollution effects, Pollution, Fresh water, Seawater, Bacteriological contamination, Recreational watercraft, Washington, Water pollution sources.

Since abatement of land-based sources of pollution is beginning to become a reality, pollution from vessels takes on a greater importance. One aspect of this problem is the overboard discharge of wastes from small recreational craft. Many states and other agencies have taken action to prevent toilet waste discharges from boats into recreational waters. Federal legislation is needed to provide an effective control of wastes from small craft. Data are presented herein from a study of the small pleasure craft pollution of two small bays in the State of Washington. In one, the influence of small boat wastes on the bacteriological quality of fresh water was clearly demonstrated. A review of the present methods for handling sewage from small craft concludes that while additional research is needed to improve the technology, the present systems are considered minimally adequate.
W70-00722

WATER USE AND THERMAL POLLUTION,
EG and G, Inc., Las Vegas, Nev.
Frank C. Di Luzio.
Power Engineering, Vol 72, No 6, p 44-46, June, 1968. 2 tab, 1 graph.

Descriptors: *Aquatic life, *Balance of nature, Water utilization, Pollution abatement, Thermal pollution.
Identifiers: Power industries.

This paper deals with the problem of thermal pollution caused by use of water in power and other industries which use water for cooling and condensing purposes and then return it to waterways. Prevention and control of this waste heat is essential for the protection of present and future uses of our aquatic resources as the delicate ecological balance can be upset by just a small change in water temperature. About 70 percent of the industrial thermal pollution load in the United States today is caused by the steam-electric power industry and it is estimated that by the year 2000 about 7,140,000 billion Btu of heat will be rejected to the rivers compared to 1,164,000 billion Btu in 1958. Important elements of the problem are the increase in toxic effects of chemical pollutants, the increase in oxygen consumption of aquatic vertebrates, a decrease in dissolved oxygen concentration and a decrease in ability of assimilating other wastes. Technological solutions to the problem can be classified into five categories, namely, to minimize the effect of waste heat on the aquatic environment, to reduce waste heat produced in thermal generation, use the waste heat, methods to cool waste heat and non-polluting methods of power generation. (Upadhyaya-Vanderbilt)
W70-00742

THE EFFECT OF TEMPERATURE ON THE ACUTE TOXICITY OF PHENOL TO RAINBOW TROUT IN HARD WATER,
Water Pollution Research Lab., Stevenage (England).
V. M. Brown, D. H. M. Jordan, and B. A. Tiller.
Water Research, Pergamon Press, Vol 1, p 587-594, 1967. 4 fig, 2 tab, 23 ref.

Descriptors: *Phenols, *Toxicity, *Temperature, Resistance, Rainbow trout.

The resistance of rainbow trout to poisoning by phenol increases with increase in temperature up to at least 18 deg C, at which temperature the 48-hour mean lethal concentration (LC50) is almost twice that at 6 deg C. The LC50 value at 6.3 deg C was 5.4 milligrams per liter (mg/l), while at 18.1 deg C the LC50 value was 9.8 mg/l. A similar relationship exists with gas-liquor phenols, common waste products from carbonization of coal. The gas-liquor phenols were found to be more toxic at all temperatures studied than did the pure phenols. (Speakman-Vanderbilt)
W70-00746

THE EFFECTS OF THERMAL EFFLUENTS ON MARINE ORGANISMS,
Virginia Inst. of Marine Science, Gloucester Point.
J. E. Warinner, and M. L. Brehmer.
Air and Water Pollution Int J, Vol 10, p 277-289, 1966.

Descriptors: *Thermal pollution, Biological properties, Benthos, Phytoplankton, Temperature, Ecology, Heated water, Primary productivity.

The assimilation of carbon by the natural phytoplankton populations of the York River is affected by an artificial increase in water temperature. The main conclusion is that the greater the temperature rise, the greater the depression of production. At the highest experienced river temperatures, a 3.5 deg C increase in temperature was sufficient to depress production. This evidence suggests that the range of tolerance to temperature narrows toward the higher natural river temperatures, since only a small temperature rise results in a great reduction in phytoplankton production at river temperature above 25 deg C. The community composition and abundance of marine benthic invertebrates in the river were also affected by the thermal discharge over a distance of 300-400 m from the discharge. This affected area was minimized by the fact that the heated water was less dense and thus stratified. Primary production was forced to increase during the winter months, however, below the power plant. (Novotny-Vanderbilt)
W70-00747

EFFECTS OF INTRODUCTION OF HEATED WATER ON STREAMS (IN GERMAN),
Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
M. Eckoldt, H. Knopp, and H. J. Liebscher.
Studie, bearbeitet im Auftrage des Bundesministers fur Gesundheitswesen, Apr 1969. Koblenz. 67 p, 31 ref.

Descriptors: *Thermal pollution, *Thermal power plants, Thermal capacity, Water temperature, Water utilization, *Water pollution effects, Self-purification, Fishing, Dissolved Oxygen, *Cooling water, Biochemical oxygen demand, Heated water, Aeration, Quality control, Water quality, Future planning, Water supply.
Identifiers: Artificial aeration.

This report summarizes possible negative effects of heated waters discharged from electric-steam power stations on streams. The report deals with the physical problems of the introduction of cooling water into streams, with its influence on the oxygen content, self-purification, biological properties, effects on water supply and shipping. The different types of cooling systems are discussed and their influence on cooling water demand is stated. The main conclusions of the report are: (1) Introduction of heated waters prevents ice formation, (2) One must take into account higher evaporation rates both in cooling towers and streams, (3) The decay coefficient for BOD has two optimum values, one at 30-32 deg C and the other at about 40 deg C, (4) Model investigations showed an increase of microbiological activity measured as BOD (2), (5) The introduction of cooling water at temperatures up to 30 deg C or heating of water up to 28 deg C could be tolerable if oxygen is supplemented. Artificial aeration has to be used in most cases, (6) Photosynthesis is influenced to a very low degree by the temperature increase, (7) A proposal for preparing maps of streams showing heat loads for future planning of steam-power stations is presented. (Novotny-Vanderbilt)
W70-00748

FISH AND FISHING AROUND TVA STEAM PLANTS.
Tennessee Valley Authority, Knoxville. Div. of Forestry Development.

TVA Report, Division of Forestry Development, 1969. 8 p.

Descriptors: *Warm water fishing, Temperature, Thermal pollution.
Identifiers: Average catch of fish.

Some of the heaviest fishing in the Tennessee valley takes place in the discharge channels and basins that receive warm water from the condensers of TVA steam plants. Various species have been observed in steam plant discharge channels at temperatures up to 100 deg F. John Sevier, with a discharge area of 6 acres, has the heaviest concentration of fish in the spring but throughout the year there were more fish in the discharge channel than in the river. Bluegill and channel catfish are the principal fishes and average catch of fishermen was 3.5 fish weighing 2.1 pounds per trip and success rate was 62%. Colbert, with fishing area of about 4 acres and discharge temperature of 9-13 degrees above lake temperature, has carpsucker, catfish, shad, carp as the principal fishes. February offered the best fishing followed by November and average catch was 2.5 fish and 1.1 pounds. Bull Run has a 3.5 acre basin and discharge temperature 10-13 degrees higher than lake temperature. The basin has 36 fish species. Both Kingston and Johnsonville discharge 10-14 degrees warmer water. The latter plant discharges to an 80 acre basin. The best months for fishing at Kingston are September, October, and May and average catch is 2.1 fish weighing 1.4 pounds per trip. At Johnsonville, the best months for fishing are October and January and average catch was 1.9 fish weighing 1.3 pounds per 3.8 hour trip. (Upadhyaya-Vanderbilt)
W70-00749

OIL POLLUTION OF THE SEA.
For primary bibliographic entry see Field 05G.
W70-00786

OIL POLLUTION OF THE SEA: THE EFFECTS OF POLLUTION.

Harv Int L J, Vol 10, No 2, p 321-323, Spring 1969. 3 p, 11 ref.

Descriptors: *Water pollution effects, *Damages, *Oil, *Wildlife, Real property, Navigation, Docks, Beaches, Recreational facilities, Marine fish, Marinas, Intertidal areas, Shellfish, Natural resources, Hazards, Aquatic environment, Fishkill, Ecology, Oily water.

Damage resulting from oil pollution falls into two categories; damage to the living resources of the sea and damage to property interests. Among the living resources affected are surface-feeding fishes and shellfish. The greatest problem may be the toxic effects on intertidal animals which serve as

food for larger fish. Large scale oil pollution also injures large quantities of water birds. Taken together, these damages adversely affect the entire chain of life in the marine environment. With respect to damage to property interests, the most noticeable damage is the fouling of recreational beaches and shorefront property. Large quantities of oil are washed ashore each year making beaches unfit for recreation and causing considerable economic loss. Oil spills also create fire hazards around docking facilities and hinder navigation. (See W70-00786). (Heckerling-Florida)
W70-00789

5D. Waste Treatment Processes

COST OF MUNICIPAL SEWAGE TREATMENT,
Illinois Dept. of Registration and Education, Urbana.
William C. Ackerman.
Technical Letter 12, Illinois State Water Survey, June 1969. 12 p, 6 fig, 3 tab.

Descriptors: *Cost analysis, *Construction costs, *Operating costs, *Sewage lagoons, *Operating costs, Mathematical studies.
Identifiers: *Illinois.

Estimating the costs of constructing and operating a municipal sewage treatment facility are possible from the data given. Such costs may be estimated from the regression lines of the figures included; confidence intervals of the best fit lines of regression are given such that the estimates are correct 16 percent of the time. Construction costs are indexed; the base of the index depended on geographical location. A table is included to facilitate comparison of construction costs. Annual unit operating costs in terms of dollars per population equivalent of wastes treated are presented. Also included is the cost of land which represents a significant proportion of capital investment for lagoon construction. Finally, a trend line of the construction cost indices is given so that forecasts may be made. An example is worked out to demonstrate how to utilize the data in estimating costs. (Grossman-Rutgers)
W70-00493

CHEMICAL INTERACTIONS OF WASTEWATER IN A SOIL ENVIRONMENT,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
B. F. Hajek.
J Water Pollut Contr Federation, Vol 41, No 10, p 1775-1786, Oct 1969. 12 p, 9 fig, 20 ref.

Descriptors: *Soil disposal fields, *Water chemistry, *Waste water (Pollution), Water reuse, Biodegradation, Permeability, Soil chemical properties, Soil physical properties, Filtration, Clays, Groundwater movement.
Identifiers: Soil-wastewater relationships.

The performance of soil as a wastewater disposal and water reclamation resource often can be predicted from laboratory data which characterize wastewater, soil, and soil-wastewater relationships. Many parameters must be studied to assess fully the ability of soil to assimilate wastewater. Some of the significant wastewater parameters are: pH, pollutant form and concentration, concentration of accompanying ions, temperature, and volume disposal characteristics. Significant soil parameters are: bulk density, grain size distribution, mineral composition, exchange capacity, and resident exchangeable cations. Soil-wastewater interrelationships are characterized by batch equilibrium and dynamic soil solumn studies. Either theoretical or empirical approaches often can be applied to these data and used to predict pollutant migration rates and concentration distributions. (Knapp-USGS)
W70-00658

NEUTRALIZATION OF ACID MINE DRAINAGE,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
David W. Hill.
J Water Pollut Contr Federation, Vol 4, No 10, p 1702-1715, Oct 1969. 14 p, 4 fig, 6 tab, 12 ref.

Descriptors: *Acid mine water, *Industrial wastes, *Water pollution control, Sulfates, Waste treatment, Neutralization, Sludge, Chemical precipitation, Chemical reactions.
Identifiers: Acid mine waste treatment.

When mining operations remove or penetrate the protective mantle of overburden of pyritic minerals, sulfides are exposed. In the presence of air and water, iron sulfides are oxidized to sulfuric acid and ferric sulfate. A study was designed to determine the possibilities of recycling sludge generated in acid mine drainage neutralization to achieve efficiency and chemical savings. Batch tests were performed on artificial acid mine drainage using ferric sulfate solution, limewater, slaked lime, and artificial dolomitic limestone. Below a pH of 4 previously precipitated sludge settled faster by recycle. Two-step neutralization provided modest savings for dilute solutions. About pH 4, dolomitic lime was a poor neutralizer. No significant benefit was achieved by recycling sludge for neutralization. (Knapp-USGS)
W70-00662

CHEMICAL PROCESSING OF WASTEWATER FOR NUTRIENT REMOVAL,
Stanford Univ., Calif. Dept. of Sanitary Engineering.
Rolf Eliassen, and George Tchobanoglous.
J Water Pollut Contr Federation, Vol 40, No 5, Part 2, p 171-180, May 1968. 10 p, 2 fig, 4 tab, 9 ref.

Descriptors: *Nutrients, *Waste water (Pollution), *Nitrogen, *Phosphorus, Ammonia, Ion exchange, Chemical precipitation, Electrochemistry, Distillation, Sorption, Reverse osmosis, Denitrification, Irrigation, Oxidation.
Identifiers: *Nutrient removal.

Nutrient removal from water, specifically the removal of nitrogen and phosphorus by chemical processes, is discussed. The nutrients can be removed from water by biological, chemical, and physical processes. The biological processes are: (1) algae stripping; (2) anaerobic denitrification; and (3) aerobic processes. The chemical processes include: (1) ammonia stripping; (2) ion exchange; (3) electrodialysis; (4) chemical precipitation; (5) sorption; (6) electrochemical treatment; and (7) oxidation. The physical processes are: (1) land application-irrigation; (2) reverse osmosis; and (3) distillation. In addition to these methods, chemical precipitation and sorption are used for phosphorus removal. The removal efficiencies for nitrogen and phosphorus compounds are 80-98% and 85-99%, respectively. The criteria for designing facilities for nutrient removal are given. (Carstea-USGS)
W70-00680

MECHANICAL RETRIEVAL OF WASTE OILS AND SOLIDS FROM WATER,
Edens Equipment Co., Chicago, Ill.
Robert W. Clyne.
Pap presented at 23rd Annu Meeting Amer Soc Lubricating Eng, Cleveland, Ohio, May 6-9, 1968. 7 p, 9 fig.

Descriptors: *Water pollution treatment, *Oily water, *Separation techniques, Water pollution control, Equipment, Mechanical equipment, Rotors.
Identifiers: Oil separation equipment.

The application of rotating cylinders for the recovery of oil spills from inland waterways and protected harbors, and for the retrieval of waste (free) oils from waste water is discussed. The general design details of permanent, fire-retardant, oil retention floating booms for marine and industrial applications are outlined. Recent developments include compact machinery for the separation of settled solids from waste water, cutting coolants, metal washing solutions, and quenching media. Ejection of the retrieved solids from the water is accomplished in the vertical plane. In contrast to pumped sludges, the solids content of ejected railroad sludges is about 40% by weight. The machine descriptions conclude with the presentation of a primary, mechanical, non-chemical oil-water-solids separator with the capability of reducing total oil content of about 85,000 ppm in waste water influent to an average of less than 100 ppm in the industrial effluent. (Knapp-USGS)
W70-00685

RECOVERY OF WASTE OIL USING FLOATING-TYPE SKIMMERS,
United States Steel Corp., Lorain, Ohio. Tooling and Methods Tubular Products Works.
Harold E. Hillyard.
Iron and Steel Engineer, Aug 1968. 4 p.

Descriptors: *Water pollution control, *Oily water, Industrial wastes, Waste water treatment, Waste disposal, Burning, Fuels, Lagoons.
Identifiers: Waste oil disposal.

Lubricant leakage and spillage that finds its way into a steel plant's sewers is recovered by means of a lagoon with floating-type skimmers. The waste oil is eventually used as a fuel at the plant boiler house. Thus, a satisfactory and economical means of disposal is provided in addition to the pollution abatement aspect. (Knapp-USGS)
W70-00686

PERFORMANCE OF NATURAL-DRAUGHT WATER COOLING TOWERS,
British Electricity Authority. Research Dept.
H. Chilton.
Proceedings of the Institution of Electrical Engineers, Vol 99, Part II, No 71, p 440-456, Oct 1952. 9 fig, 5 tab, 10 ref.

Descriptors: *Cooling towers, Heat balance, Heat flow, Heat transfer, Air circulation.
Identifiers: *Natural draft towers, *Cooling tower theory, Merkel's approximate integration, Water-air ratio, Performance coefficient.

The fundamental theory of natural-draught cooling towers is presented. After a brief general discussion, the work of previous investigators is summarized. A convenient approximate treatment of the transfer process due to Merkel is expressed as a nomogram. The conditions under which the approximations lead to appreciable errors are defined in a form suitable for practical use. The variation of air rate through a natural-draught cooling tower with design and operating conditions is defined by an approximate equation. It is shown that routine design and performance data can be reduced to two dimensionless quantities between which correlation would be expected on theoretical grounds. By considering numerous test results in conjunction with the theoretical relationships it is shown that all tests on a given tower can be represented by a single number, termed the 'performance coefficient' which is substantially independent of tower size and so offers a useful basis for comparison, interpolation and extrapolation between towers of comparable design. The application of the performance coefficient and a related quantity to the solution of practical problems is discussed and illustrated by worked examples. (Ross-Vanderbilt)
W70-00745

OIL POLLUTION OF THE SEA: CLEANING UP.

Harv Int L J, Vol 10, No 2, p 355-359, Spring 1969. 5 p, 18 ref.

Descriptors: *Water pollution control, *Cleaning, *Oil, *Pollution abatement, Detergents, Treatment, Beaches, Oceans, Chemical degradation, Chemcontrol, Project planning, Wildlife conservation, Steam.

Regardless of what type or how many preventative measures are used, oil spills will still occur. The problem then becomes one of how to clean up. The basic aim of any cleanup operation is either to collect the oil or to disperse it over as great a volume of open sea as possible so that bacterial action will eventually destroy it. Detergents are probably the most widely used material for treatment of oil pollution. Unfortunately, they often cause more damage to wildlife than does the oil itself. Attempts have been made to burn oil but this has proved impractical. Recently certain compounds designed to absorb or sink oil have been employed. Thus far these methods have proved to be much cheaper than others and less damaging to marine resources. Another technique useful especially for large spills is dispersant chemicals. One half gallon of such material will dispurse fifty gallons of oil. In relatively calm waters, booms and boats employing skimmers or suction pumps can be used to contain and remove small quantities of oil. Talc and other absorbers and steam cleaning have been used to clear beaches and rocks. To date, there has been a lack of coordination and inadequate knowledge of natural conditions which have resulted in disastrous consequences. (See W70-00786). (Heckerling-Florida)
W70-00796

5F. Water Treatment and Quality Alteration

ECONOMIC EFFECTS OF USING SUBSTANDARD QUALITY WATER IN WEBSTER AND OTHER COMMUNITIES IN SOUTH DAKOTA.
South Dakota State Univ., Brookings. Coll. of Agriculture and Biological Sciences.
For primary bibliographic entry see Field 03C.
W70-00727

5G. Water Quality Control

UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA,
Minnesota Univ., St. Paul. Agriculture Extension Service.
John J. Waelti.
Minn Univ Agr Ext Bull No 359, July 1969. 27 p, 4 fig, 2 tab, 7 photo, 11 ref. OWRR Proj No A-019-MINN.

Descriptors: *Water quality, *Water pollution effects, *Water pollution sources, *Legal aspects, *Minnesota, Economics, Social aspects, Legislation, Governments, Water quality act.
Identifiers: *Minnesota water quality.

Water quality, quality standards, pollution sources, pollution effects, water quality control, and water quality legislation are explained in a publication intended for the use of interested voters. Efforts were made to state the subject matter simply while retaining a high degree of technical accuracy. A growing population with greater affluence, more leisure time, and greater mobility has imposed competing demands on the natural resources of Minnesota. Industrial development and urban growth have accelerated the deterioration of quality in Minnesota's lakes, streams, and ground water supplies. As a consequence of expanding demand, fresh water must be used and reused many times before it returns to oceans or to the hydrologic cycle. Each use generally results in deterioration of water quality. Competition for limited resources gives rise to controversy - and even in Minnesota, which is generally viewed as a 'water rich' state, water is sometimes a very limited resource depending on alternative uses. (Knapp-USGS)
W70-00430

REDUCING LAND SUBSIDENCE IN THE WILMINGTON OIL FIELD BY THE USE OF SALINE WATERS,
Long Beach Dept. of Oil Properties, Calif.
Robert L. Pierce.
Proc Amer Geophys Union Meeting, Apr 21-25, 1969, Pap H-68, 1969. 11 p, 10 exhibits, 5 ref.

Descriptors: *Injection wells, *Sea water, *Oil fields, *Subsidence, *California, Land subsidence, Withdrawal, Costs, Water pollution control.
Identifiers: Oil field subsidence correction, Water flooding (Oilfield).

The subsidence at Long Beach, California attributed to the Wilmington Oil Field development encompassed an area of 22 sq mi. Subsidence ranged from 2 ft to 30 ft, but the oil field is partially in the tidelands of Long Beach, California, and the Pacific Ocean provided a convenient supply of saline water necessary to correct subsidence by injection of sea water. The injection of saline water has successfully stopped the Long Beach Harbor area subsidence. By 1968, 2.1 billion barrels of saline water were injected into the Wilmington Oil Field. The bulk of this was ocean water produced from source wells open to sands 200 ft to 400 ft deep. The current injection rate of the field is 1.1 million barrels per day. Expanded use of the oil field's produced brine for injection is taking place and 550,000 barrels per day of this brine will replace source well water during 1969. The methods being used to clean the oil field's produced brine include: (1) filtration, (2) recycling through the shallow source water beds, and (3) blending with fresh or other saline waters. (Knapp-USGS)
W70-00447

AIR POLLUTION PUBLICATIONS - A SELECTED BIBLIOGRAPHY WITH ABSTRACTS, 1966-1968.
Library of Congress, Washington, D.C. Science and Technology Div.

For sale by Supt of Documents, US Government Printing Office, Wash DC 20402. Price $4.50. Dep Health, Educ, and Welfare Nat Air Pollut Contr Admin Bibliogr Rep, 1969. 522 p, 1,088 ref, 2 index.

Descriptors: *Bibliographies, *Abstracts, *Air pollution, Air pollution effects, Path of pollutants, Pollutant identification, Legal aspects, Social aspects, Public health.
Identifiers: Air pollution bibliography.

A selective bibliography of air pollution publication by National Air Pollution Control Administration (NAPCA) personnel and other persons and organizations receiving Federal air pollution funds was compiled by the Special Bibliographies Section of the Science and Technology Division of the Library of Congress. The bibliography contains over 1,000 entries spanning the literature of 1966-1968. Previous bibliographies, PHS Publication No. 979 (Revised 1964) and No 979 (Revised 1966) cover the years 1955-1963 and 1963-1966, respectively. The bibliography consists of references, with abstracts, to the literature originated by the staff and grantees of NAPCA on the subject of air pollution published during the period July 1966 through December 1968. The major portion of the material included consists of journal articles. In addition, books, monographs (handbooks, collections of papers delivered at conferences and symposia, etc.) and some report literature are also covered. While the bulk of the material is abstracted from English language publications, certain foreign items (mostly based on PHS grants awarded abroad) have also been included. (Knapp-USGS)
W70-00452

ECONOMICS OF AIR AND WATER POLLUTION.
Virginia Polytechnic Inst., Blacksburg. Donaldson Brown Continuing Education Center.
Virginia Water Resources Research Center, Virginia Polytechnic Institute, Short Course, Apr 28-30, 1969. 303 p, 17 articles, 2 append.

Descriptors: Water quality, Sewage effluents, Cost-benefit analysis, Pollution abatement.
Identifiers: *Economics of water pollution, Externalities.

This publication contains 17 articles, six of which deal with different aspects of water pollution. The areas covered are: externalities and water quality; public versus private goods; effluent changes; waste abatement and U. S. subsidies; selected issues of cost-benefit analysis; and, the measurement of economic losses from uncompensated externalities. One appendix lists the participants in the three day short course and the second appendix lists the biographical information of the speakers. (See also W70-00487 thru W70-00491). (Grossman-Rutgers)
W70-00486

COST-BENEFIT ANALYSIS: SELECTED ISSUES,
Virginia Univ., Charlottesville. Dept. of Economics.
Roland N. McKean.
Virginia Water Resources Research Center, Virginia Polytechnic Institute, Short Course, p 134-146, Apr 28-30, 1969. 13 p, 2 ref.

Descriptors: *Cost-benefit analysis, *Intangible benefits, *Intangible costs, Recreation facilities, Welfare (Economics).
Identifiers: *Externalities, Aesthetic values.

The problem in cost-benefit analysis is the valuation of inputs and outputs of a proposal. Subjective benefits are the spill over benefits or externalities of a project; i.e. beneficial consequences that do not pass through a market and for which there is no direct evidence regarding how much people are willing to pay for them. Possible ways of measuring aesthetic values are: comparing values of projects that contain certain aesthetic characteristics with those projects that do not; consult an expert panel. Recreational services are also subjective benefits, and one method of evaluating such services is to estimate differences in the amounts people are willing to spend for travel to and from the facility. Costs inflicted on others that do not pass through any market are therefore not voluntarily accepted because of an exchange. Such costs are difficult to evaluate. The value of these social benefits and costs depend on the welfare criterion accepted by society. Several virtues of cost-benefit analysis are discussed. (See W70-00486). (Grossman-Rutgers)
W70-00487

THE USE OF SUBSIDIES FOR WASTE ABATEMENT,
Clemson Univ., S.C. Dept. of Economics.
Hugh H. Macaulay.
Virginia Water Resources Research Center, Virginia Polytechnic Institute, Short Course, p 74-99, Apr 28-30, 1969. 26 p, 12 ref.

Descriptors: *Waste water disposal, *Quality control, Taxes, Depreciation.
Identifiers: *Subsidies, Externalities.

The allocation of water among different uses and the maintenance of high water quality are difficult to achieve because of cultural lags, uncertainties over ownership and the right to use streams, and externalities or social costs. Three systems for achieving optimum water quality are: a system of taxes or charges; a system of subsidies; and a system of rules and regulations. Four arguments for subsidies are: (1) pollution abatement equipment does not contribute to production; (2) pollution abatement benefits those downstream; (3) increased costs for abatement may drive some firms out of business; and (4) subsidies produce the same effects as charges do. Five arguments against subsidies are: (1) subsidies cause a misallocation of resources; (2) subsidies encourage greater output;

(3) subsidies do less to encourage the discovery of more efficient means of waste disposal than do charges; (4) the size of a subsidy is more difficult to determine than the amount of a charge; and (5) the form of a subsidy may produce misallocative effects. Two forms of subsidies are accelerated depreciation and tax credits. (See W70-00486). (Grossman-Rutgers)
W70-00488

EFFLUENT CHARGES,
Resources for the Future, Inc., Washington, D.C.
Clifford S. Russel.
Virginia Water Resources Research Center, Virginia Polytechnic Institute, Short Course, p 51-73, Apr 28-30, 1969. 23 p, 4 fig, 12 ref.

Descriptors: *Sewage effluents, *Prices, Decision making, Cost analysis, Management, Discharge (Water).

Economists are interested in effluent charges for they are interested in the manner in which market prices link the complex system of resource allocation. A theoretical examination of the role of market prices and the affect on effluent charges is given. To illustrate how market prices affect effluent charges a simple, illustrative case is explored. The conditions of optimal waste removal are illustrated. Cost functions, including total, average, and marginal costs, are utilized in the discussions. In applying a system of effluent charges the water manager is faced with institutional, political, technological, and economic problems. Such problems are discussed. Effluent charges are useful in the administration of schemes based on stream standards. (See W70-00486). (Grossman-Rutgers)
W70-00489

EXTERNALITIES AND THE QUALITY OF AIR AND WATER,
Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Economics.
Otto A. Davis, and Morton I. Kamien.
Virginia Water Resources Research Center, Virginia Polytechnic Institute, Short Course, p 15-20, Apr 28-30, 1969. 15 p.

Descriptors: *Water allocation (Policy), *Cost-benefit analysis, Real costs.
Identifiers: *Pareto optimality, *Externalities.

The costs and benefits associated with any desired level of air and water quality in the context of modern economic concepts are explained. In the allocation of resources, such as air and water, opportunity or real costs are incurred. The criterion of best allocation is pareto optimality which asserts that an allocation of resources is optimal if no reallocation could make some members of society better off without making others worse off. What should be produced and how much are questions not answered by pareto optimality, but by value judgements as transmitted through political processes. The market mechanism allocates resources which are compatible with consumer sovereignty. Perfect competition leads to a pareto optimality equilibrium mix of commodities. Pecuniary externalities exist when the buying decision of an individual affects price. Technological externalities exist when one decision unit affects the decisions of other units. Examples of both types of externalities are given. (See W70-00486). (Grossman-Rutgers)
W70-00490

PUBLIC VS. PRIVATE GOODS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Economics.
Charles Goetz.
Virginia Water Resources Research Center, Virginia Polytechnic Institute, Short Course, p 30-41, Apr 28-30, 1969. 11 p.

Descriptors: *Resource allocation, *Water pollution, Riparian rights.
Identifiers: *Public good, *Private good, Externalities.

Supposedly the normal profit-making incentives of individual trade serves to allocate resources (e.g. air and water) to their most valuable uses: Public goods are goods which embody an interdependency aspect which leads to a serious form of economic decision-making dilemma among individuals. Two conditions by which public goods are: (1) jointness - the ability of one physical unit of the good to provide services to more than one user; and (2) non-excludability-a defect in the property rights attached to a good. Water resources meet these two conditions of a public good. Non-excludability causes individual units to act as if they are unconcerned about pollution in the hope that another agent will clear up the problem. Interdependency also results in a bargaining difficulty called the hold out problem. Decisions as to the use of a public good such as water is based on individual actions. An example is used to explain the principles of a public good. (See W70-00486). (Grossman-Rutgers)
W70-00491

PANEL DISCUSSION ON WATER QUALITY CONTROL,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 06B.
W70-00502

PANEL DISCUSSION ON WATER QUALITY,
Northwest Pulp and Paper Association.
For primary bibliographic entry see Field 06B.
W70-00504

PANEL DISCUSSION ON WATER QUALITY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 06B.
W70-00505

MUNICIPAL CORPORATIONS-WATERS AND WATERCOURSES-EMINENT DOMAIN-POLLUTION OF WATER AS A 'TAKING' OF PRIVATE PROPERTY,
Brooks F. Crabtree.
Mich L Rev, Vol 40, No 5, p 750-752, Mar 1942. 3 p, 13 ref.

Descriptors: *Washington, *Water pollution, *Compensation, *Municipal wastes, Eminent domain, Cities, Judicial decisions, Public health, Riparian land, Land tenure, Sewage disposal, Rivers, Damages, Reasonable use, Legal aspects, Legislation, Public rights.
Identifiers: Constitutional law.

In Snavely v City of Goldendale, 117 P. 2d 221 (Wash 1941), plaintiff sued defendant city for damages caused to his land by the continual discharge of raw sewage into a river upstream from plaintiff's riparian land. The pollution rendered the water of the river unfit for domestic use and dangerous to health. The Supreme Court of Washington held that although the plaintiff failed to allege the necessary elements for a tort action against a municipality, under the state constitution he would have a valid cause of action for damages. The constitutional article provided that 'no private property shall be taken or damaged for public or private use without just compensation having first been made...' In some cases, public necessity and social welfare have been held to allow a municipality to dispose of sewage into natural watercourses even though a private owner would not have a similar right. In some states, a municipality may be given sewage drainage rights by statute, but this right cannot be exercised in such a manner so as to amount to an unconstitutional taking or damaging of the lower riparian owner's property. The practical solution is to give the municipalities a right of eminent domain and allow just compensation for damages. (Heckerling-Florida)
W70-00520

LIABILITY OF LANDOWNERS FOR POLLUTION OF PERCOLATING WATERS,
Robert E. Sharp.
Marq L Rev, Vol 39, No 2, p 119-134, Fall 1955. 16 p, 97 ref.

Descriptors: *Remedies, *Water pollution, *Percolating water, *Relative rights, Water law, Ground water, Subsurface water, Percolation, Subsurface runoff, Subsurface streams, Deep percolation, Ground water movement, Infiltration, Path of pollutants, Seepage, Penetration, Industrial wastes, Sewage, Waste water (Pollution), Legal aspects.
Identifiers: Trespass, Negligence, Nuisance, Strict liability.

The problems associated with pollution of percolating waters has increased with the rapid expansion of residential and industrial complexes into areas which see a high degree of percolated water use. The remedies available to the landowner who finds his water supply polluted fall into four basic areas: trespass, negligence, nuisance, and strict liability. Some jurisdictions do not hold to a right to undefiled waters, basing their opinions on the concept of damnum absque injuria which means a loss without injury. Other jurisdictions hold that there is an unlimited right to use percolating water, and contamination of such water so as to render it unfit for use when it comes onto a neighbor's land is a violation of the neighbor's rights for which an action can be maintained. Once the right to reasonable purity of percolating waters is postulated, the only remaining problem concerns the grounds on which the suit should be brought. Trespass is difficult to rely on, and negligence gives rise to sustaining the burden of proof. Nuisance has certain advantages as it is only necessary to show that the well has been polluted and that defendant has maintained a nuisance that has caused pollution. Strict liability makes the proof of a nuisance almost a matter of fact. (Moulder-Florida)
W70-00521

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 5 CONSUMPTIVE USE OF WATER: COMMON LAW RULES,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W70-00532

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 9 STATE ADMINISTRATION OF WATER RESOURCES IN FLORIDA,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W70-00536

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 11 THE LAW AND ADMINISTRATION OF POLLUTION CONTROL IN FLORIDA,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W70-00538

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 13 A LOOK TO THE FUTURE,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W70-00540

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
Ray F. Goudey.
Am Water Wks Ass'n J, Vol 39, No 10, p 1010-1020, Oct 1947. 11 p, 3 ref.

Descriptors: *Groundwater, *Water supply, *Water management (Applied), Conjunctive use, Water pollution control, Water pollution sources, Water pollution effects, Adoption of practices, Water conservation, Water resources, Standards, Water quality, Water supply, Water demand, Water requirements, Water utilization, Legal aspects, Water allocation (Policy).

General standards cannot be developed for the protection of all groundwater. Each problem must be solved on its own merits. State agencies have exercised some control over stream pollution since the 1860's. State legislatures have increased the powers of some of their administrative agencies, such as health departments and fish and game commissions, and have in some cases, created new departments. States have joined together in efforts to solve common stream pollution problems. These developments toward increased protection might be followed in regard to ground water protection. The ways that injuries to ground waters may adversely affect domestic, irrigational, and industrial supplies are discussed and examples are given to illustrate them. The necessity of supervisory control over public and industrial uses of ground water is stressed. (Kelly-Florida)
W70-00542

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
Ray F. Goudey.
Am Water Wks Ass'n J, Vol 39, No 10, p 1010-1015, Oct 1947. 11 p, 3 ref.

Descriptors: *Groundwater, *Standards, *Water quality, *Water pollution control, Administrative agencies, Water utilization, Water conservation, Water management (Applied), Water shortage, Water pollution sources, Water quality control, Drainage, Legal aspects, Water policy, Water resources, Planning, Water allocation (Policy), Natural resources.

Groundwater protection is connected with stream pollution control because percolating waters create groundwater which may again reach surface streams. The value of water as a natural resource is inestimable. Groundwater is usually restricted first to domestic, industrial, and irrigational uses and then to conveyance of sewage and industrial wastes underground. Control of pollution has been undertaken by various state agencies. Health departments have borne the bulk of pollution control in the past. Fish and game commissions have also been important agencies for state protection of streams. Industrialized states are adding specialized departments to such agencies. Interstate commissions, such as that created by the Tri-state Compact, also deal in protection of natural watercourses. Few states, however, have specifically included groundwaters in their protective statutes. It is recommended that pollution controls be enacted which encompass the boundaries of entire drainage areas, rather than political boundaries. Commissions should be established for these pollution control areas with powers to review pollution discharges, investigate and plan control works, and set standards of permissible pollution. (Kelly-Florida)
W70-00543

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
Ray F. Goudey.
Am Water Wks Ass'n J, Vol 39, No 10, p 1015-1020, Oct 1947. 11 p, 3 ref.

Descriptors: *Ground water, *Water pollution, *Water pollution control, *Standards, Water conservation, Water policy, Water management (Applied), Administration, Water pollution treatment, Reasonable use, Water quality, Water utilization, Non-consumptive use, Non-structural alternatives, Use rates, Legal aspects, Irrigation, Industrial wastes, Domestic water, Water supply, Water treatment, Classification.

Identifiers: *Artificial pollution, *Natural pollution.

Investigations conducted for ground water protection should differentiate between natural and artificial pollution. Discharge of sewage, use of water for irrigation, and use of fertilizers are among the common interferences by man with ground water supplies. Pollution may affect domestic, irrigational, and industrial supplies in a number of ways, in regard to quantity and quality of ground water available. Problems with pollution of ground water in some cases have become sufficiently critical to require control measures. All factors causing deterioration of the ground water supply should be noted. Some states require detailed plans by industries concerning methods of water treatment. Industry should be required to meet certain standards, but has certain rights which should not be ignored, such as the right to continued reasonable use of surface and ground waters without impairment of quality. The suitability of ground water for domestic, irrigation, or industrial use could be determined through a system of classification. (Kelly-Florida)
W70-00544

POLLUTION OF WATERS OF STATE.

Ind Ann Stat secs 68-517 thru 68-543 (1961).

Descriptors: *Water pollution control, *Indiana, *Eminent domain, *Programs, Legislation, State governments, Water conservation, Standards, Pollution abatement, Administrative agencies, Interstate, Methodology, Decision making, Regulation, Inter-agency cooperation, Pollutant identification, Cost sharing, Condemnation, Grants, Water pollution, Water quality.
Identifiers: *Water Pollution Control Act.

An administrative board known as 'The Stream Pollution Control Board of the State of Indiana' is created. The membership, powers, duties, organization, jurisdiction, and enforcement powers of the board are outlined. Procedures for the determination of pollution standards within the state and the legal sanctions available to insure compliance are provided. Included are both the procedure to be used in determining if violations have occurred and the penalties to be imposed for such violations. Additional powers are given to 'The Stream Pollution Control Board of the State of Indiana.' These powers include the right to represent the state in all matters relating to water pollution and the power to condemn land when necessary to control or eliminate water pollution. (Schram-Florida)
W70-00578

POLLUTION OF WATERS OF THE STATE: THE STREAM POLLUTION CONTROL BOARD OF THE STATE OF INDIANA.

Ind Ann Stat secs 68-517 thru 68-522 (1961).

Descriptors: *Water pollution control, *Indiana, *Administrative agencies, *Treatment facilities, Legislation, Programs, State governments, Water conservation, Standards, Pollution abatement, Methodology, Decision making, Pollutant identification, Supervisory control, State jurisdiction, Inspection, Evaluation, Waste disposal, Waste treatment, Administration, Water pollution, Water quality.

An administrative board known as 'The Stream Pollution Control Board of the State of Indiana' is created. The membership of the board, their compensation, their powers and duties, and the general organization of the board are detailed. The board is given jurisdiction to control and prevent pollution in the waters of this state. To this end, the board may bring any appropriate action in law or in equity in the name of the state of Indiana. After a hearing, the board may order any legal entity to acquire, construct, repair, alter, or extend such plants as may be necessary for the disposal or treatment of matter which is causing or contributing to the polluted condition of the waters of Indiana. The board is given the right to enter any private or public property for the purpose of inspecting and investigating conditions relating to water pollution and may receive all necessary assistance from any state institution to carry out the provisions of this act. (Schram-Florida)
W70-00579

POLLUTION OF WATERS OF STATE.
Ind Ann Stat secs 68-523 thru 68-534 (1961).

Descriptors: *Water pollution control, *Indiana, *Administrative agencies, *Standards, Legislation, Programs, State governments, Water conservation, Pollution abatement, Regulation, Decision making, Methodology, Pollutant identification, Public health, Quality control, Water pollution, Water quality.

Provisions for the determination of water pollution standards and legal sanctions available to insure the maintenance of such standards are set forth. The stream pollution control board is given the power to set these standards and make orders and regulations restricting further pollution. It is made unlawful to cause or allow any such pollution, and the board is given the power to serve notice upon any offender. A detailed procedure for enforcement of this act is outlined, and failure to comply with the orders of the board is made a misdemeanor. An additional fine is provided for each day such polluted condition continues. The power of the board extends to all lakes, rivers, streams, drainage ditches, roadside ditches, underground water, and all other surface and sub-surface water within the state. (Schram-Florida)
W70-00580

POLLUTION OF WATERS OF STATE.
For primary bibliographic entry see Field 06E.
W70-00581

GREAT LAKES BASIN COMPACT.
For primary bibliographic entry see Field 06E.
W70-00592

AN ENVIRONMENT FIT FOR PEOPLE,
For primary bibliographic entry see Field 06G.
W70-00603

NATURAL RESOURCES: QUALITY AND QUANTITY.
For primary bibliographic entry see Field 06G.
W70-00605

COMMENT ON ECONOMY OF WATER QUALITY MANAGEMENT AND POLLUTION CONTROL,
Cornell Univ., Ithaca, N.Y.
Louis Michael Falkson.
IN The Fresh Water of New York State: Its Conservation and Use, p 58-60, Wm C Brown Book Co, Dubuque, Iowa, 1967. 3 p. Edited by Hitchcock, Lauren B.

Descriptors: *Water pollution, *Water pollution control, Economics, Planning, Model studies, Optimization, Water quality, Costs.
Identifiers: Objective function, Benefit function, Loss function, Effluent charges, Water resource planners.

Non-economists in the water pollution control field tend to look for answers from the economist, or some sort of justification for decisions which have already been made. The economist's major potential contribution is the conceptual framework which he can provide for analyzing the problem of water pollution. The concept of optimization is a recurrent and basic economic problem. However, until benefit functions for water quality are esti-

mated, the economist's optimization model cannot be applied. If a second best solution is sought in which certain predetermined stream standards are met at least cost values, a system of effluent charges could achieve the same result and at considerably less administrative cost than existing practices. However, effluent charges are not entirely acceptable and the economist's alternative solutions to the problem are needed. (Loeb-Rutgers)
W70-00613

RESEARCH GOALS AND PROGRESS TOWARD THEM,
Resources for the Future, Inc., Washington, D.C.
Allen V. Kneese.
Environmental Quality in a Growing Economy, Baltimore, The Johns Hopkins Press, p 69-87, 1966. 19 p, 24 ref. Edited by Henry Jarrett.

Descriptors: *Environment, *Water pollution, *Effluents, *Public health, *Water resources planning, Marketing, Sewage, Management, Systems analysis, Damages costs, Industrial water, Hudson River, Streams, Water quality, Recreation, Air pollution, Waste water treatment, Transportation.
Identifiers: *Value-based rules, *Quality management, *Welfare economics, Public policy, Calculus, Optimality, Regional-scale opportunities, Utility.

The article is concerned with the useful study of environmental quality problems. Economic studies of these problems fall into four categories: conceptual and methodological studies, empirical evaluation studies, control systems studies, and studies bearing upon desirable institutional change. Knowledge of the economics of alternative systems of management when combined with technical knowledge can be the basis for great opportunities for research and constructive innovations in the areas of politics, law, and administrative organizations. In economic studies, optimum rules, standards, or other techniques for controlling environmental quality must result from analyses of values. If, as often happens, such value-based rules cannot achieve optimal environmental quality management, more direct and explicit collective action on a regional scale is indicated. Finally, appropriate research on how to design suitable institutional and organizational arrangements is needed to implement management systems and procedures suggested by economic and engineering analysis. This article is of interest to the water resource researcher due to the key role he plays in this economic analysis of the environment and also due to the extensive use of water resource studies in the planning process. (Murphy-Rutgers)
W70-00619

NEUTRALIZATION OF ACID MINE DRAINAGE,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 05D.
W70-00662

A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
Arkansas State Dept. of Health, Little Rock. Div. of Radiological Health.
E. F. Wilson, and D. D. Snellings, Jr.
Radiol Health Data and Rep, Vol 10, No 8, p 341-345, Aug 1969. 5 p, 8 tab.

Descriptors: *Radioactive wastes, *Radiation, *Control, *Arkansas, *Regulation, *Monitoring, Safety, Radioisotopes, Inspection, Data collections, Data processing, Safety factors.
Identifiers: Division of Radiological Health.

The State of Arkansas has regulated the use of radioactive material for a 5-year period from 1964 through 1968. This report is a summary of regulatory activities of the Division of Radiological Health. The early (1964) regulatory inspections did not include sufficient data pertaining to the occupational exposure of individuals to radiation; however, the noted deficiencies of records and radiation safety are well documented. In early 1967, the Division of Radiological Health prepared all previous data for electronic data processing, and currently all regulatory inspections, as well as licensing activities, are prepared for electronic data processing on a routine basis. (Carstea-USGS)
W70-00678

MECHANICAL RETRIEVAL OF WASTE OILS AND SOLIDS FROM WATER,
Edens Equipment Co., Chicago, Ill.
For primary bibliographic entry see Field 05D.
W70-00685

RECOVERY OF WASTE OIL USING FLOATING-TYPE SKIMMERS,
United States Steel Corp., Lorain, Ohio. Tooling and Methods Tubular Products Works.
For primary bibliographic entry see Field 05D.
W70-00686

ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
William Whipple, Jr.
New Jersey Water Resources Research Institute Report, Rutgers University, New Brunswick, New Jersey. Paper presented at Fifth Annual American Water Resources Association Meeting, Oct 27-30, 1969. 16 p.

Descriptors: *Environmental effects, *Economic benefits, *Intangible benefits, *Water pollution effects, Economic efficiency, Economic justification, Benefits, Water quality, Public health, Recreation, Flow augmentation.
Identifiers: *Recreational environment, *Home environment, *Working environment, *Water quality benefits, Alternative means, Instream aeration.

The Water Resources Council states that benefits of water quality should be evaluated, but little progress has been made. Economists have contributed mostly to evaluation of water based recreation, which is only one of basic aspects. A recent report on the Potomac River based justification upon intangibles only; but this is not satisfactory. Systems analysis and comprehensive planning with multiple objective functions are illusory without evaluation of water quality benefits. Efficiency benefits of water quality could be evaluated under three categories: recreational environment, home environment, and working environment. Some intangibles would remain for consideration.
W70-00730

CONTRIBUTION OF PHOTOSYNTHETIC REAERATION TO TOTAL REAERATION OF THE PASSAIC RIVER,
For primary bibliographic entry see Field 05B.
W70-00731

THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
Wisconsin Univ., Madison.
Silas Robert Lyman.
Thesis, University of Wisconsin, Madison, Wis, May 1969. 269 p. OWRR Project A-022-WIS.

Descriptors: *Legislation, *Riparian rights, *Water law, *Pollution abatement, Effluents.
Identifiers: *Private property rights, *Ad valorem tax, *Navigation provisions, Northwest Ordinance, Water pollution damage.

This thesis examines various constitutional objections which might be raised against effluent charges. An effluent charge was defined as a variable charge imposed on waste dischargers based upon the quality and quantity of waste they discharged and computed upon the basis of the approximate damage done to others by each unit of the effluent. The revenue raised would not be used to compensate injured downstream riparians, but either would defray the costs of a state-operated pollution abatement system or would become part of the general revenue. This definition was used because it raises the more serious constitutional questions. The constitutional questions examined were whether the charge constitutes an invalid exercise of the police power, whether it would constitute a taking of private property rights without compensation, whether the charge system would require an unlawful delegation of legislative power to an administrative agency, whether the charge amounts to an ad valorem tax which must be uniform, whether imposing the charge would violate the freedom of navigation provisions of the Northwest Ordinance and Wisconsin Constitution, whether the charge system would deprive riparians of their common law right to obtain court relief from damage caused by water pollution, whether municipalities had any grounds to object to state-imposed charges, whether the charges could be imposed as an exercise of the federal or state navigation servitude and whether they could be imposed by the state under its power as trustee to protect and manage the waters of the state for the benefit of the public. It is concluded that properly drafted effluent charge legislation would be within the state's constitutional power and would not be subject to the constitutional objections examined. (Davis-Univ of Wisconsin)
W70-00766

FEDERAL AIR AND WATER CONTROL: THE APPLICATION OF THE COMMERCE POWER TO ABATE INTERSTATE AND INTRASTATE POLLUTION,
Sidney Edelman.
Geo Wash L Rev, Vol 33, No 5, p 1067-1087, June 1965. 21 p, 122 ref.

Descriptors: *Pollution abatement, *Federal jurisdiction, *Clean Air Act, *Legislation, Federal government, Air pollution, Water pollution, Air pollution effects, Path of pollutants, Water pollution control, Water pollution sources, State jurisdiction, Administrative agencies, Navigable waters, Interstate, Governments, Interstate rivers, Riparian rights, Rivers and Harbors Act, Reservoirs, Atmosphere, Public health, Navigation, Aircraft, Legal aspects.
Identifiers: *Interstate commerce.

There must be a constitutional basis for such acts as the Federal Water Pollution Control Act and the Clean Air Act. Under these statutes, the fact that pollution crosses state lines is considered an appropriate basis for the exercise of federal authority, but federal action may be taken only upon request when the effects are limited to the state of the discharge. The validity of abatement of interstate water and air pollution hinges on the determination that the movement of such pollution is itself commerce. That commerce is not limited by economic considerations, that the nature of the material moved is not a factor, and the fact that it is not purposefully directed across a state line is immaterial; Congress can regulate interstate commerce to forbid the use of such commerce to promote the spread of any evil or harm to other states. Control over intrastate water pollution is justified by the appropriate jurisdiction of Congress over both interstate and intrastate navigable waters under the commerce clause, as well as by plenary powers over navigable waters that do not require a commerce nexus. (Douberly-Florida)
W70-00771

INTERSTATE COOPERATION IN RIVER BASIN DEVELOPMENT,
For primary bibliographic entry see Field 06B.
W70-00784

OIL POLLUTION OF THE SEA.

Harv Int L J, Vol 10, No 2, p 316-359, Spring 1969. 44 p, 176 ref.

Descriptors: *Water pollution, *International waters, *Oil, *Oceans, Legal aspects, Legislation, International law, Judicial decisions, Remedies, Damages, United States, Oil industry, Ships, Water pollution control, Water pollution treatment, Water pollution effects, Water pollution sources, Pollution abatement, Accidents, Wildlife conservation, Costs, Disasters, International commissions, Transportation, United Nations, Oil wastes.
Identifiers: *Oil pollution.

The purpose of this comment is to give a brief introduction to the problems caused by oil pollution of the sea and to the response given by the American and international community. Worldwide attention has focused on this problem due to unfortunate recent catastropes like the grounding of the oil tanker 'Torrey Canyon' and the escape of crude oil from the well off Santa Barbara. The author considers oil pollution of sea water from the following aspects: the sources of pollution; the effects of pollution; the response of the international community including the United States and multi-national conventions; the action of the United States; private remedies; the efforts of the oil and shipping industries; enforcement of control by detection; and methods of cleaning up. (See also W70-00787 thru W70-00796). (Heckerling-Florida)
W70-00786

OIL POLLUTION OF THE SEA: THE INTERNATIONAL RESPONSE.

Harv Int L J, Vol 10, No 2, p 323-332, Spring 1969. 10 p, 33 ref.

Descriptors: *International commissions, *Water pollution control, *Pollution abatement, *Oil, Jurisdiction, Legal aspects, International waters, Continental shelf, Oceans, Judicial decisions, Ships, Regulation.
Identifiers: Flag of convenience.

Beginning in the 1920's, the international community tried to find a solution to the oil pollution problem, but action was hampered because the urgency of the problem was not appreciated. More recently, conflicting national interests and problems of enforcement and jurisdiction have hindered a solution. The United States was one of the first proponents of an international conference to deal with oil pollution. Although a conference was held in Washington in 1926, no real progress came forth until the London conference in 1954. The conference promulgated a 15 point convention on oil pollution. The convention met with slow acceptance. In 1962, the London Conference was reconvened and a series of amendments were proposed for addition to the 1954 convention. The conference also adopted a number of resolutions to prevent oil pollution. In spite of these conventions and resolutions, problems of effective detection, prosecution, and civil liability remain. (See W70-00786). (Heckerling-Florida)
W70-00790

OIL POLLUTION OF THE SEA: THE INTERGOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION.

Harv Int L J, Vol 10, No 2, p 332-339, Spring 1969. 8 p, 19 ref.

Descriptors: *Water pollution control, *International commissions, *Oil, *United Nations, Pollution abatement, Regulation, Administrative agencies, Legal aspects, Oceans, Ships, Compensation, Damages, Project planning, Programs, Jurisdiction.
Identifiers: *Inter-governmental Maritime Consultative Organization.

The Inter-governmental Maritime Consultative Organization (IMCO) is a specialized agency of the United Nations. The IMCO Convention was drawn up by a United Nations Maritime Conference meeting in 1948, but it was not ratified by the requisite number of nations until 1957. IMCO has accepted the responsibilities given it by the 1954 International Convention for Prevention of Pollution of the Sea by Oil. It also undertook the oil pollution functions voted to the UN by a resolution of the 1954 London Conference. During its first ten years of existence IMCO was rather inactive. In 1967, IMCO met in London and initiated study problems in both legal and technical areas. IMCO has now organized a broad program to study the advisability of implementing a variety of new maritime regulations. The Legal Committee of IMCO has been studying various proposals for a multilateral treaty dealing with pollution liability. The draft seeks to establish the liability of a tanker owner for pollution damage caused by the escape of oil from his ship and to provide for an international system of compensation. (See W70-00791). (Heckerling-Florida)
W70-00791

OIL POLLUTION OF THE SEA: UNITED STATES ACTION.

Harv Int L J, Vol 10, No 2, p 338-345, Spring 1969. 7 p, 30 ref.

Descriptors: *Water pollution control, *United States, *Legislation, *Oil, Federal Government, Accidents, Judicial decisions, Pollution abatement, Legal aspects, Oil industry, Legislation.
Identifiers: Oil Pollution Act of 1961, Oil Pollution Act.

The first federal legislation designed to regulate oil pollution was the Oil Pollution Act passed in 1924. The act prohibited the discharge of oil except in cases of 'emergency' or 'unavoidable accident.' The courts had difficulty determining when, in fact, an accident was 'unavoidable.' Not until the United States' ratification, with reservations, of the 1954 London Conference did this nation move forward in the area. The Oil Pollution Act of 1961 implemented the 1954 Convention. Amendments to the 1961 Act were passed in 1966 under the title of Pollution of the Sea by Oil and implemented the provisions of the Convention as amended in 1962. In 1966, amendments were made to the Oil Pollution Act of 1924, making the 1924 Act unenforceable. Several major bills were presented to the 90th Congress. In 1967, the Senate passed the Federal Water Pollution Control Act Amendments of 1967. The Oil and Hazardous Substance Pollution Control Act of 1968 was proposed in the House. Neither of these bills was adopted because of strong oil industry opposition. (See W70-00786). (Heckerling-Florida)
W70-00792

OIL POLLUTION OF THE SEA: PRIVATE REMEDIES.

Harv Int L J, Vol 10, No 2, p 346-350, Spring 1969. 5 p, 19 ref.

Descriptors: *Remedies, *Water pollution, *Oil, *Damages, Adjudication procedure, Judicial decisions, Admiralty, Ships, Legal aspects, Jurisdiction, United States.
Identifiers: Liability, Common law.

Oil spillage may produce substantial damage to private littoral owners and users. The legal remedies now available to persons thus injured have three important aspects: jurisdiction, basis of liability, and scope of liability. The Admiralty Jurisdiction Act of 1948, has in the United States been held to apply to a ship's discharge of oil. Subject-matter jurisdiction would be compatible with several possible forums. The general maritime law of the United States primarily governs in such cases. Admiralty courts have drawn on a body of tort law from the common law of the states. Many common law principles are employed by the admiralty courts. While the measure of damages is also specially determinable by the admiralty courts, common law principles are generally used. One of the major limitations on damages is the value of the shipowner's interest in the ship and the freight 'pending', except where the injury is within the 'privity or knowledge' of the owner. In case of large scale loss, recovery is difficult because the liability fund has been all but destroyed. Imputing knowledge to the owner is also very rare. (See W70-00786). (Heckerling-Florida)
W70-00793

OIL POLLUTION OF THE SEA: THE EFFORTS OF THE OIL AND SHIPPING INDUSTRIES.

Harv Int L J, Vol 10, No 2. p 350-353, Spring 1969. 4 p, 11 ref.

Descriptors: *Water pollution control, *Oil industry, *Pollution abatement, *Insurance, Compensation, Damages, Ships, Waste water disposal, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Waste disposal, Fuels.

The shipping and oil industry have not been completely oblivious to the dangers of oil pollution. The industries have been somewhat willing to enter into voluntary arrangements to control pollution. Recently, a number of preventative steps have been taken by the industry to reduce the discharge of oil into the sea. One of these measures is a system which allows tankers to burn crude oil and 'slope' instead of bunker fuel. The most promising technique to prevent pollution from ballasting and cleaning operations is the 'load-on-top' system. This system takes advantage of the fact that oil is lighter than water. After ballasting and cleaning operations, water is pumped out from the bottom of the mixture, leaving only a small amount of water mixed with the oil. Another example of industry cooperation is the recent organization of tanker owners, the International Tankers Owners Pollution Federation, Ltd, which administers a self-insurance plan to reimburse national governments and the tanker owner members for the cost of dealing with oil spillages. (See W70-00786). (Heckerling-Florida)
W70-00794

WATER POLLUTION CONTROL ACT.
W Va Code Ann, sec 20-5A-1 thru 20-5A-2 (1966), as amended, (Supp 1968).

Descriptors: *West Virginia, *Water quality control, *Standards, Legislation, State governments, Legal aspects, Public health, Water quality, Water resources, Water pollution, Wastes, Sewage, Industrial wastes, Sewage disposal, Water utilization, Quality control, Water pollution effects, Water pollution control.

It is the public policy of West Virginia to maintain reasonable standards of water purity and quality consistent with: (1) public health enjoyment; (2) the propagation and protection of animal and plant life; and (3) the attraction, development, and expansion of business and industry. As used within this article, the term 'water resources' includes all waters on or beneath the surface of the ground, whether percolating, standing, diffused or flowing, wholly or partially within the state, or bordering on the state and within its jurisdiction. The term 'pollution' shall mean the discharge or deposit, directly or indirectly, of sewage or waste in or near waters of the state in such quantity as does, or is likely to either contribute substantially to the contamination of such waters or contribute substantially to the alteration of the physical, chemical, or biological properties of any such waters when such alteration is directly or indirectly detrimental to public welfare, animal and plant life or makes the water unsuitable for commercial, recreational, or other legitimate uses. (Gabrielson-Florida)
W70-00806

OHIO RIVER VALLEY WATER SANITATION COMPACT.
Ind Ann Stat secs 68-601 thru 68-605 (1961).

Descriptors: *Ohio River, *Indiana, *Pollution abatement, *Interstate commissions, Water pollution control, Administration, Public health, Water resources, Inter-agency cooperation, Administrative agencies, River basin commissions, Programs, Interstate compacts, Water pollution, Water quality, Legislation, Standards, Sewage, Waste disposal, Solid wastes, Industrial wastes, Sewage treatment, Treatment facilities, Surveys, Planning.
Identifiers: Water sanitation districts.

The Ohio River Valley Water Sanitation Compact is adopted by Indiana. The purpose of the compact is to control future pollution and to abate existing pollution in the Ohio River drainage basin in order to eliminate the menace to the health, welfare, recreational facilities, and water supplies in said basin. The compact creates the 'Ohio River Valley Water Sanitation District' and establishes the Ohio River Valley Water Sanitation Commission to control water sanitation within this district. Although no single standard is imposed, the states agree that pollution by sewage or industrial wastes originating in a signatory state shall not injuriously affect interstate waters. Water that is to flow into the Ohio is required to be treated so as to completely remove settleable solids and remove not less than 45% of the total suspended solids. In addition, the Commission is empowered to impose a higher degree of treatment if necessary. The Commission is to draft uniform legislation dealing with pollution problems and is to consult with and advise the various states, municipalities, corporations, and persons with regard to the construction of plants for the disposal of sewage, industrial, and other waste. The Commission is empowered to issue orders to any municipality, corporation, or entity discharging sewage or waste into the Ohio River to abate, modify, or treat such discharge. (Schram-Florida)
W70-00826

STREAM POLLUTION.

Miss Code Ann secs 5931.01-5931.04 (Supp 1968).

Descriptors: *Interstate compacts, *Tennessee River, *Water pollution, *Mississippi, Interstate rivers, State governments, Legislation, Water districts, Water law, Pollution abatement, Legal aspects, Regulation, Standards, Control, Financing, Administrative agencies, Coordination, Planning, Political aspects, Costs, Cost sharing, Operating costs, Interstate commissions.

The Tennessee River Basin Water Pollution Control Compact is designed to promote effective control and reduction of pollution in the Tennessee River Basin through interstate cooperation and coordination. An interstate commission shall be created to establish the Tennessee River Basin Water Pollution Control District consisting of all areas drained by the Tennessee River. The Commission shall study the overall pollution problems, recommend legislation, render advice, and after public hearings, recommend minimum standards of water quality. No single standard will be appropriate for all areas or uses of water, and the Commission shall create appropriate standards for each area or use. A state pollution control agency may certify alleged violations of commission standards to the Commission. A hearing will be held, and appropriate recommendations will be made to the state pollution agency. If the recommendation is not followed, the Commission may issue orders that may be enforced in any court of competent jurisdiction. (Darragh-Florida)
W70-00835

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH VALIDITY TESTING OF A COMPARATIVE-PROJECTOR MODEL,
Texas A and M Univ., College Station. Water Resources Inst.
John E. Pearson, and Kenneth E. Heideman.
Technical Report No 20, Water Resources Institute, Texas A and M University, Aug, 1969. 181 p, 53 tab, 53 ref, 5 append. OWRR Proj B-019-TEX.

Descriptors: *Economics, *Simulation, *Model studies, *Economic prediction, Economic impact, Computer model, Texas, Project planning, Reservoir stages, Simulation.

An established economic simulation model for reservoir development was applied to ten reservoir projects throughout Texas. The model as a predictor of economic impact was given a difficult test because of the diversity of geographic, economic, and social characteristics surrounding the reservoirs. Additional difficulty was provided because the reservoirs were in different development stages--Construction, Fill-up, and Post Fill-up. The simulation model was developed in a previous research effort on two central Texas reservoir areas--Belton Reservoir and Whitney Reservoir--and these areas were retained in the study for check purposes. A third reservoir area--Somerville Reservoir--for which earlier predictions were made was observed for differences between model predictions and actual development. A synthetic (or 'business activity') index was developed for measuring accuracy of the model in the thirteen reservoir areas. Initial applications pointed out weaknesses in recreation projection and total impact calculations. Only partial success with an early application of the model to all reservoir areas necessitated a detailed analysis of all internal model relationships. Revisions were incorporated by using primary data from on-site observations at each area and secondary data from various sources. A reapplication of the model showed the revisions had increased the accuracy for all but two reservoir areas. The revised simulation model provided a systematic and relatively accurate tool for measuring and projecting economic impact surrounding a developing reservoir area. The project data, the results and recommendations of the study are published as Technical Report No. 20 of the Water Resources Institute, Texas A and M University. Copies of the report have been sent to all persons cooperating and furnishing data for the study.
W70-00479

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 13 A LOOK TO THE FUTURE,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W70-00540

PLANT SIZING FOR A SEASONAL PRODUCT DEMAND USING A LINEAR PROGRAMMING MODEL,
Ohio State Univ., Columbus.
Lawrence D. Vitt.
The Engineering Economist, Vol 14, No 1, p 25-40, Fall 1968. 16 p, 2 fig, 4 tab, 8 ref.

Descriptors: *Linear programming, *Investment, Mathematical models, Demand, Capital, Industrial production, Costs, Constraints, Planning.
Identifiers: *Plant sizing, *Seasonal product demand, *Linear programming model, Least cost scheduling, Capacity, Inventories, Substitution process, inputs

This paper presents a method for determining least cost scheduling-investment programs for a firm with a seasonal product demand. The basic problems to be analyzed are the sizing and the timing of the firm's capital investments for plant and equipment. In investment appraisals, one of the most difficult problems is to determine the profitability of each alternative investment. The capital investment problem for a firm with a pronounced seasonal demand pattern lends itself to this type of analysis because the firm may substitute extra shift production, overtime production, or seasonal anticipation inventories for plant capacity. Thus, in developing its annual production plan a firm may substitute current production inputs for capital inputs in the form of buildings and production equipment. An Investment Analysis Model is developed to analyze the substitution process for the capital and the current inputs. A linear programming model of the firm's production smoothing problem is an important element in the Investment Analysis Model and is used to develop an optimum annual production plan for each alternative level of plant capacity. Such a model may prove applicable in the water area when planners are concerned with problems such as investment in water systems where the demand on these systems has significant seasonal variation. (Loeb-Rutgers)
W70-00604

RESOURCE QUALITY: NEW DIMENSIONS AND PROBLEMS FOR PUBLIC POLICY,
California Univ., Berkeley.
Michael F. Brewer.
Natural Resources: Quality and Quantity, p 197-212, University of California Press, Berkeley and Los Angeles, 1967. 16 p.

Descriptors: Water pollution, Natural resources, Energy, Oil, Recreation.
Identifiers: *Resource quality, *Public policy, Federal policies, Multiple uses, Federal resource agencies, Objectives, Organizational improvement.

The contemporary emphasis on highway aesthetics, the growing awareness of the problem of water pollution, our increased apprehension of the consequences to human health of smog, have all given rise to a broad public concern with the quality of our environment and its component resources. This concern has stimulated efforts to better understand the problems faced by users of particular resources, as well as by the general public, and to undertake correction measures. This new sensitivity to quality poses new problems for public resources agencies and requires new dimension of public policy. Federal policies and programs for natural resources operate through a complex network of organizations. The attempt to base public programs for resource management on our understanding of an ill-defined goal of quality imposes a heavy burden on the federal agencies, which are slow to respond because of their very complexity. In what way does resource quality enter the domain of public policy, and what are the implications for the programs of resource agencies. The author proposes to identify the requirements imposed on the federal resource agencies by considerations of quality and to suggest ways in which these agencies might accommodate such considerations more effectively in their programs and policies. The important role of water quality in the environmental problem and the responsibilities of the appropriate federal agencies with respect to water quality standards make this article of general relevance to the water researcher. (See W70-00605). (Loeb-Rutgers)
W70-00612

ECONOMIC ANALYSIS OF ALTERNATIVE FLOOD CONTROL MEASURES BY DIGITAL COMPUTER,
Kentucky Univ., Lexington.
Thomas M. Rachford.
Water Resources Institute, Research Report No 1, 1966. OWRR Proj A-001-KY. 157p.

Descriptors: *Economics, *Flood control, *Digital computers, Population, Discount rate, Flood

damage, Costs, Flood plains, Floodproofing, Channel improvement.
Identifiers: Right-of-way value, population projection, open space amenities, sensitivity studies, Input, Output.

A digital computer program is developed in this project for selecting the optimum combination of flood proofing, flood-plain land use, channel improvement, and residual flood damage for a given flood-plain. The optimum policy is selected, based on economic efficiency, for each planning unit of the total flood-plain for each period of time called a planning stage. The program designed for the project was used to test the sensitivity of the optimum combination of measures to variation in discount rates, right-of-way value, population projections, value of open space amenities, adversion to large annual variation in flood damage, costs of restricting flood-plain land use, costs of flood proofing, and costs of channel improvements. It was also used to analyze the effectiveness of land use, flood proofing, and channel improvement used individually and in various combinations. (Loeb-Rutgers)
W70-00617

OPTIMAL WATER ALLOCATION: THE NORTH PLATTE RIVER,
North Carolina State Univ., Raleigh; and Chase Manhattan Bank, New York.
For primary bibliographic entry see Field 06D.
W70-00629

OPTIMUM ALLOCATION OF WATER RESOURCES BY MATHEMATICAL PROGRAMMING,
Rand Water Board, Johannesburg (South Africa).
David Stephenson.
J Hydrol, Vol 9, No 1, p 20-33, Sept 1969. 14 p, 2 fig, 11 tab, 5 ref.

Descriptors: *Water resources development, *Water allocation (Policy), *Water management (Applied), *Systems analysis, *Optimization, Computer programs, Mathematical models, Distribution patterns, Cost analysis.
Identifiers: Transportation programming, South Africa.

Optimization of water distribution plans is facilitated by transportation programming. For the purpose of compilation of an optimum water supply pattern, costs of conveying water from every possible source of water to each consumer within the system are calculated. The optimization is commenced by initially assuming arbitrary quantities along various routes, and then redistributing the quantities in a routine manner until no further improvement in cost is evident. Application of the technique to minimizing total cost of water conveyance is illustrated with an example. Extension of the method, using the principle of decomposition of linear programs, permits selection of optimum areas for development. Results of a large scale application to the Orange and Vaal River basins in South Africa are presented. (Knapp-USGS)
W70-00641

COMPUTER-ORIENTED METHOD OF OPTIMIZING HYDROLOGIC MODEL PARAMETERS,
Soil Conservation Service, Chickasha, Okla. Southern Plains Branch; and Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
Donn G. DeCoursey, and William M. Snyder.
J Hydrol, Vol 9, No 1, p 34-56, Sept 1969. 23 p, 4 fig, 5 tab, 5 ref.

Descriptors: *Mathematical models, *Optimization, *Parametric hydrology, *Systems analysis, Digital computers, Computer programs, Regression analysis, Mathematical studies, Statistical methods.
Identifiers: Hydrologic systems.

Hydrologic studies and significant advancement in hydrologic understanding are based upon interpretive analysis and hydrologic observations. The rational beginning point of such an inductive process is the construction of a conceptual model. Realistic hydrologic models are not normally simple forms, but the quantification and verification require specialized optimizing methods. Optimum values of the coefficients of mathematical models can be found by an iterative reduction of the residual error of estimates of the coefficient values. Orthogonal corrections to the coefficients are insured by using principal component analysis to regress the error term on a group of correction terms. A digital computer program capable of performing the optimization has been tested on 4 models of varying complexity and used on several fieldscale models. The optimized values of the coefficients are a function of the number of roots used in the solution. Convergence is not a function of the number of observations, feedbacks, random noise, or equation complexity. The optimization method discussed should be applicable in any discipline with significant inputs of interpretive data analysis. (Knapp-USGS)
W70-00642

THE USE OF EXPONENTIAL FUNCTIONS WHEN CONSTRUCTING THE LAWS OF THE DISTRIBUTION OF GEOGRAPHICAL AND HYDROMETEOROLOGICAL PARAMETERS (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Meteorology; and Moscow State Univ. (USSR). Dept. of Climatology.
For primary bibliographic entry see Field 02A.
W70-00657

6B. Evaluation Process

THE ROLE OF MARINE SCIENCES IN THE MULTIPLE USES OF THE COASTAL ZONE OF LAKE ERIE AND LAKE SUPERIOR,
National Planning Association, Washington, D.C. Center for Techno-Economic Studies.
For primary bibliographic entry see Field 02L.
W70-00457

ECONOMICS OF AIR AND WATER POLLUTION.
Virginia Polytechnic Inst., Blacksburg. Donaldson Brown Continuing Education Center.
For primary bibliographic entry see Field 05G.
W70-00486

COST-BENEFIT ANALYSIS: SELECTED ISSUES,
Virginia Univ., Charlottesville. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W70-00487

INSTITUTIONAL FACTORS AND THE TEXAS WATER PLAN,
Texas A and M Univ., College Station. Water Resources Inst.
Warren L. Trock, and Clarence W. Jensen.
Western Agricultural Economics Association, Annual Meeting, Texas A and M University, 1969. 10 p, 17 ref. P.L. 88-379 (Texas). OWRR Proj B-025-TEX.

Descriptors: *Governments, *Jurisdiction, Economic feasibility, Technical feasibility.
Identifiers: *The Texas Water Plan, 1969.

The Texas Water Plan of 1969 presents problems of engineering, economic feasibility, cost-sharing, financing and water pricing, and institutional arrangements. The federal, state, and local governments are concerned with these problems. The federal government will be concerned with matters that affect several states and regions such as water surplus apportionment and cost sharing. The state government is concerned with state-wide problems such as the allocation of water among various uses, pricing policies, and management. Local and county authorities are more concerned with problems which serve local interests such as local water supply, guarding their investments in facilities, and protecting their positions as debtors. (Grossman-Rutgers)
W70-00492

FEDERAL NATURAL RESOURCES DEVELOPMENT: BASIC ISSUES IN BENEFIT AND COST MEASUREMENT,
George Washington Univ., Washington, D.C.
Jack L. Knetsch, Robert H. Haveman, Charles W. Howe, John V. Krutilla, and Michael F. Brewer.
Natural Resources Policy Center, The George Washington University, Washington, D.C., May 1969. 12 p.

Descriptors: *Cost-benefit analysis, Social impact, Planning, Federal Government.

Water resource projects by governmental agencies absorb inputs and produce outputs. Therefore, these projects provide the opportunity to measure the benefits and costs. In public projects, all the costs and benefits must be evaluated besides the receipts or disbursements of the agency undertaking the project. Six principles as to the measurement of benefits and costs, based on appropriate economic concepts of social benefits and social costs, are explained. (Grossman-Rutgers)
W70-00494

BENEFIT-COST ANALYSIS FOR WATER RESOURCE PROJECTS: A SELECTED ANNOTATED BIBLIOGRAPHY,
Tennessee Valley Authority, Washington, D.C.
Hubert Hinote.
Center for Business and Economic Research, The University of Tennessee, June 1969. 148 p.

Descriptors: *Bibliographies, *Reviews, *Cost-benefit analysis, Water control, Navigation, Quality control, Recreation, Supply.
Identifiers: Land-value enhancement.

This publication contains a bibliography dealing with benefit-cost analysis of water resources. Each reference is followed by a short note on its contents. The areas covered by the references are: basic works, flood control, navigation, water quality (pollution) control, recreation, water supply, land-value enhancement, and some related bibliographies. Also included are an author index and an index to government and other agency publications. (Grossman-Rutgers)
W70-00495

SUCCESS OF WATERSHED DEVELOPMENT IN LOCAL COMMUNITIES,
P. Thomas Cox.
Natural Resources Journal, Jan 1969, Vol 9, p 23-34. 4 tab, 1 fig.

Descriptors: *Watershed management, *Analysis, Statistical methods, Evaluation, Variability, Regression analysis, Social values, Economics, Decision-making.
Identifiers: Socio-economic analysis, Multiple discriminant analysis, General factor analysis, Multiple regression analysis.

Primarily concerned with the assessment of success and failure, followed by adjustments and adaptations to these findings in watershed projects, this study attempts to discover the causes of disparity in rate of development found between upstream watershed projects. It is hypothesized that social economic data are reflections of man's reactions to his environment, and that if this is true, it is possible to analyze and observe data of community variables in such a way as to categorize or classify communities according to their performance, with performance defined as ability to achieve specified

goals which, in this case, would be development of the community's water resources. The hypothesis is tested by classifying the rate of progress of 115 upstream watershed development projects in Oklahoma, based on the time lag for a project to process through the various stages of development. With rate of progress as the dependent variable and 22 selected socio-economic variables as the independent variables, multiple discriminant analysis, general factor analysis, and multiple regression analysis are applied to the data. In addition, a sample survey of persons actually engaged in project development at the local level is carried out. Through these procedures it is possible to identify and assess factors contributing to the success of development. Differences do exist in rates of progress by communities, and these differences when known, are useful in the establishment of priorities, in providing information for decision-making, and in further study of the reasons for disparity in rates of development. (Marriott-Chicago)
W70-00497

FORECASTING REGIONAL ECONOMIC GROWTH: SOME PROBLEMS AND PITFALLS,
Oregon Univ., Eugene.
James N. Tattersall.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, p 75-83, Mar 1964.

Descriptors: *Regional analysis, Economic justification, Statistical methods, Population distribution patterns.
Identifiers: Location theory, Outmigration.

There are three broad statistical frameworks generally used today in regional economic studies: there is the regional accounts approach; the input-output approach; and the economic base approach. These techniques are useful devices for classifying information. There is, however, no one simple technique for making predictions or policy judgements almost automatic. Some shortcomings of existing regional studies are noted: (1) the method of defining regions, particularly group-of-states regions. A broad regional study can easily miss significant intra-regional changes; (2) population assumptions based on projecting past trends which accepts population growth as an independent variable. Obviously if employment opportunities do not occur, population growth will be smaller; (3) the assumption that outmigration is undesirable; (4) growth industry hypothesis which fails to recognize the crucial role of production and transportation costs in locational decisions; (5) straight line projections of economic indicators. The characteristics of what the author contends are good regional studies are: (1) use of various statistical frame works and techniques which are not substitutes for analysis; (2) use of location theory; (3) use of economic analyses that are consistent with forecasts for other regions and are sensitive to intra-regional variations; (4) data sufficiently disaggregated; and (5) value judgements about goals of regional growth are clearly specified. (Starr-Chicago)
W70-00498

AREAS OF DEFICIENCY AND RESEARCH NEEDS IN WATER RESOURCE PLANNING,
Henry Stewart.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, p 101-105, Mar 1964.

Descriptors: *Research and development, Alternative costs, Economic analysis, Water resource management, Political aspects, Social aspects, Public benefits.
Identifiers: Alternative benefits.

Lack of adequate communication is seen as one of the greatest deficiencies in modern water resource planning. Another deficiency in water resource planning is the tendency to use the degree of economic justification as a deciding factor in plan formulation. The benefit-to-cost ratio tends to be maximized at the expense of maximization of conservation, development, and beneficial use of the water resource. To minimize this deficiency, planners must look beyond economic analysis and the benefit-to-cost ratio and recognize current urgent needs and political facts of life so that they can select those projects to be accepted and supported by the public. Problems in research are outlined: (1) who will pay the bill for research - the general public and the ultimate beneficiary of proper water planning, or the immediate user; (2) the question of pure research versus applied research; and (3) economic analyses which do not include comparisons of specific individual projects and alternative projects. (Starr-Chicago)
W70-00501

PANEL DISCUSSION ON WATER QUALITY CONTROL,
Oregon State Univ., Corvallis.
Malcolm H. Karr.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, p 46-47, Mar 1964.

Descriptors: *Water quality, Research and development, River basin planning, Stream degradation.

The need for developing practical water quality objectives is pointed out. These objectives shouls be realistic for each area under consideration, since few standards would have nationwide applicability. Even individual streams are considered to require different standards for different sections. The successful development of suitable water quality objectives for river basin planning is dependent upon basic and applied research in the field of water. Basic research should be a function of the universities; applied research could properly be undertaken by regional and national laboratories and agencies. (Starr-Chicago)
W70-00502

CONSERVATION AND SOCIAL OBJECTIVES OF COMPREHENSIVE RIVER BASIN PLANNING,
Bureau of Outdoor Recreation, Washington, D.C.
Fred J. Overly.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, p 48-53, Mar 1964.

Descriptors: Recreation, Benefit-cost ratio, River basin planning, Economic impact, State planning.

The role and objectives of the Bureau of Outdoor Recreation in Comprehensive River Basin Planning is reviewed. Public Law 85-470 established their mission: (1) determining the outdoor recreation needs of the American people in the years 1976 and 2000; (2) determining the resources of the nation to satisfy the need; and (3) determining the policies and programs to insure that the needs are adequately met. A nationwide plan has been developed and technical assistance is given to the States in the preparation of outdoor recreation plans. State plans are a prerequisite for a state to obtain financial assistance under the Land and Water Conservation Fund. Funding would come from recreation users through entrance fees at certain Federal areas; from fuel tax paid on gasoline used in motorboats; from proceeds of sale of Federal surplus real property; and from advance appropriations which would be repaid from the Fund over a period of time. The Bureau's chief responsibility is the integration of recreation planning with other resource planning. While the intangible benefits of recreation are difficult to evaluate on a monetary basis, it can be done. Recreation is a major factor in the economy of the country and particularly in certain regions of the country. In the Pacific Northwest, recreation ranks third in the region's economy. ORRRC determined in its study that recreation contributed more than 20 billion dollars annually to the nation's economy. (Starr-Chicago)
W70-00503

PANEL DISCUSSION ON WATER QUALITY,
Northwest Pulp and Paper Association.
Donald J. Benson.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, p 43-45, Mar 1964.

Descriptors: *Water quality, Water use, Water demand, Water law, Downstream effects, Industrial wastes.

Contention of the author is that the use of water means a change in water quality, and changes in water quality are almost never an improvement. Therefore, increased demands for water usually means a deleterious effect upon the quality of the water resource. The adoption of severly limiting criteria such as a water quality objective for drinking water is seen as being harmful to any comprehensive plan, since the use of water by industry is inevitable and since the effluents produced by industry are incompatible with drinking water quality. Planners must therefore allow for this use. The accepted rules of water quality control - 'protection of downstream beneficial use' and 'one legitimate use shall not supplant another' are viewed as reasonable rules. They are not adequate, however, for determining what bodies of water shall be allowed to have more use than others. Nor are they enough to establish reasonable criteria for heavy industrial use that will not tend to block future expansion of industry into an area. The establishment of water quality control law based on water criteria objectives rather than set standards is proposed as the method of implementation of adequate plans. (Starr-Chicago)
W70-00504

PANEL DISCUSSION ON WATER QUALITY,
Geological Survey, Washington, D.C.
L. B. Laird.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, p 40-42, Mar 1964.

Descriptors: *Water quality, River basin planning, Technological impact, Research and development.

Basin planning has one goal, for the full development of water resources, the full economic development of the basin while maintaining a suitable quality of water to meet the varying demands. The basin planner needs to know: (1) the present quality of the water resources; (2) data on the current water qualitydemands; (3) future demands; (4) knowledge of the impact that changing water use will have on water quality; and (5) knowledge of the hydro-geologic system of the basin. Research needs outlined are: relationships between solutes, sediments and biota; influence of municipal waste disposal; and influence of reservoir storage on water quality. (Starr-Chicago)
W70-00505

WATER QUALITY OBJECTIVES,
Keith S. Krause.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, p 34-37, Mar 1964. 1 tab.

Descriptors: *Water quality, Water utilization, Economic feasibility, Standards reliability.
Identifiers: *Goals and objectives.

Author defines water quality as being good when it does not interfere with legitimate uses and as being poor (in various gradations) when it interferes with some or many uses. While it is difficult to describe what is really meant by water quality, the author feels it is necessary to develop a rational means of measuring water quality and what objectives or goals shouls be considered. Congress has established two laboratories for determining the detrimental effects of pollutants. Since not all the necessary scientific information on these pollutant-

use relationships are known, goals will have to be determined in a subjective manner. Furthermore, it will be necessary to judge the established goals as they relate to present and probable future water uses at specific locations. In attempting to make the judgments, user groups and regulatory groups are examining the evidence and helping to establish desirable objectives. The development of an economic rationale for determining the economic value of comparative water qualities is seen as an essential process in the preservation and conservation of the water resource. (Starr-Chicago)
W70-00506

A MEASURE OF WATER RECREATION BENEFITS: THE MERAMEC BASIN EXAMPLE,
Edward L. Ullman.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, p 15-29, Mar 1964. 3 tab, 7 fig.

Descriptors: *Recreation, Benefit-cost ratio, Reservoirs, River basin planning.
Identifiers: Meramec Basin Project.

A description of an approach to assigning a value to an intangible activity such as recreation, using the Meramec Basin Project, outside of St. Louis, as an example. A principal conclusion reached is that the benefits from recreation vary from place to place, in relation to size of market and lack or alternative opportunities, and that, therefore, recreation is not as important a purpose for some regions as it is for others. In St. Louis, an area where there is little alternative opportunities for water recreation, it was necessary to determine if there was justification for creating a large body of water for such a purpose. Surveys were conducted to see where St. Louis residents were presently going for their water recreation and to determine their reactions to a new reservoir closer to home. An attendance prediction model was developed from the results of the surveys, and this in turn, was translated into dollars of benefits. Dollar values were assigned to savings in mileage, and time, and estimates were made of what monetary benefits would derive from an admission charge. A figure of $4,728,000 was derived as the total figure of benefits to be derived from the creation of a new reservoir. It is important to note a one visitor day benefit figure cannot be developed; each reservoir requires a different figure for individual benefits as well as attendance prediction. (Starr-Chicago)
W70-00507

PERSPECTIVES ON ENVIRONMENTAL PLANNING AND RESOURCE DEVELOPMENT,
Michigan State Univ., East Lansing.
Sanford S. Farness.
IN Water Resources Planning in Illinois, Illinois Board of Economic Development, Illinois Conference on Water Resources Development, 1964. p 6-12.

Descriptors: *Environmental engineering, Decision making, Water resources development, Social aspects, Regional analysis, River basins.
Identifiers: *Environmental planning, Regional planning.

The recent regional spread of urban settlement, commuting patterns, labor supply and market areas are compelling cities to be concerned with regional factors in meeting the increased needs for urban land, water disposal, flood control, forests, parks and open space. Water resources and water-connected problems are now strategic factors in environmental design. The strategic importance of water resources as a man-environment relationship now and as a critical factor in future development raises to new prominence the river basin region. In this framework, the elements and systems of nature and society emerge as interdependent factors. Environmental planning, which includes physical, biological and social space planning is set squarely in a cultural value, human community and landscape-creating context and is slowly being defined as a process. The key problems to be overcome are: 91) that concepts and methods utilized in projecting population and economic change are inadequate and ignore policy-making determinants; (2) unbalanced economic perception and thinking based upon meeting the demands of production and consumption; and (3) exclusion in the planning process of intangibles such as justice, freedom, emotional and ecological fitness, and beauty. (Starr-Chicago)
W70-00510

THE FEDERAL COMPREHENSIVE SURVEYS,
Roy T. Dodge.
IN Water Resources Planning in Illinois, Illinois Board of Economic Development Illinois Conference on Water Resources Development, p 12-14, 1964.

Descriptors: *Water resources development, *River basin development, Economic efficiency, Project planning, Social function.
Identifiers: *Upper Mississippi River Basin, Economic base studies.

A brief background of river basin planning is presented. Comprehensive basin planning is one phase of the General Investigation program of the U.S. Army Engineer Corps; the other phase is the specific detailed project surveys designed for project authorization and construction. A description of the planning effort for the Upper Mississippi Basin is given. Three general aspects of this effort are: (1) planning objectives; (2) methodology of planning; and (3) current status and anticipated results. In terms of the first aspect, the ultimate objective is to contribute to the improvement of the economic and social climate of the Upper Mississippi Valley through: (1) increased production of agricultural products through control of flood waters and soil erosion and proper land use; (2) storage of surface waters to reduce flood damage and provide water supply; and (3) provision of fish and wildlife and recreation areas. The methodology employed for the Upper Mississippi Basin consists of four principal phases: (1) appraisal of the current and prospective economic potential of the basin; (2) the projections for this potential is then translated into needs for the control, regulation and use of water and related land resources; (3) examination of the water and land resource available in the basin to meet projected needs; and (4) comparison of the resources and land capabilities with the needs developed from economic projections which results in an assessment of the potential improvements best suited for the timely development of those resources to satisfy present and projected needs. The planning effort is accomplished through the efforts of eight work groups organized on a functional basis. (Starr-Chicago)
W70-00511

PLANNING FOR WATER RESOURCE DEVELOPMENT: THE FORMULATION OF A STRATEGY,
Northwestern Illinois Planning Commission.
Matthew L. Rockwell.
IN Water Resources Planning in Illinois, Illinois Board of Economic Development Illinois Conference on Water Resources Development, p 15-16, 1964.

Descriptors: *Water resources development, Groundwater, Surface waters, Land use.
Identifiers: *Metropolitan planning, Northeastern Illinois.

The unique characteristics of metropolitan areas make it desirable to approach planning for water management on a metropolitan scale. There are at least four characteristics of metropolitan areas which distinguish them from other types of planning units: (1) metropolitan areas represent economic units with internal linkages strong enough to offset the divisional features of the physical environment, e.g., drainage basins and surface streams; (2) metropolitan areas give rise to a wide diversification of demands that are concentrated in a limited area and which frequently exceed the available resource; (3) myriad of governments having fragmented authority from the standpoint of both area and functional jurisdiction; (4) the large concentration of population and industry in metropolitan areas and the accompanying human and financial resources makes possible bold programs for management of water resources. Northeastern Illinois with an average daily inflow of about 10 billion gallons per day appears to be rich in water resources. However, the capture and efficient use of this continuously renewing resource can be realized only through comprehensive water resource development and management. The major elements of the metropolitan water system which have potential for management and which are of sufficient quantity to be of regional significance are: surface water inflow from beyond the metropolitan area, groundwater, and surface water runoff from rainfall and evapotranspiration. Seven policies are outlined which are the basis of a strategy of development and management of the water resouce in Northeastern Illinois. The seven policies will be reflected in a land-use plan being developed by the Northeastern Illinois Planning Commission. (Starr-Chicago)
W70-00512

MAKING THE STATE AN EFFECTIVE PARTNER IN WATER DEVELOPMENT,
Cornell Univ., Ithaca, N.Y.
Leonard Dworsky.
IN Water Resources Planning in Illinois, Illinois Board of Economic Development, Illinois Conference on Water Resources Development, p 16-21, 1964.

Descriptors: *Federal-state water rights conflict, *State jurisdiction, State governments, Local governments, Water resource development.
Identifiers: National needs, Regional needs.

The history of the role of the States in water resource development is presented. Areas of involvement in the past included: (1) canals and internal improvements; (2) land reclamation, drainage and improvement of water courses; (3) water supply; and (4) water law. Today states play a broad role within the federal system in connection with many aspects of water resources planning, although this role has been largely overshadowed by Federal water resource development efforts. The areas of involvement today include: (1) municipal and industrial water supplies; (2) agricultural water supplies; (3) water pollution control; (4) soil and water conservation; (5) watershed development and recreational development; (6) basic data collection; (7) legislative provision for water and related land developments at local and regional levels; and (8) interstate cooperation on water allocation, water supply and pollution control. Most of these roles have been enacted, for the most part, largely within state boundaries, often with inadequate coordination between state agencies, and with unclear objectives. Recommendations are made for strengthening state water resource programs. A strong state program is seen as reflecting three aspects: (1) the desires and needs of its citizens; (2) a greater responsibility to insure that local government effort is timely and consistent with the state development program; and (3) a relating of the state needs to longer regional and national needs. (Starr-Chicago)
W70-00513

DEVELOPING POSITIVE PUBLIC ATTITUDES FOR WATER RESOURCE DEVELOPMENT,
Frank P. Zeidler.
IN Water Resources Planning in Illinois, Illinois Board of Economic Development, Illinois Conference on Water Resources Development, p 21-25, 1964.

Descriptors: *Attitudes, *Political aspects, *Social aspects, Research and development, Technology.
Identifiers: *Voluntary organizations.

As a result of rapid population and industrial growth, water has become the Nation's No. 1 natural resources problem. The author's contention is that the main problem in water resource development is how to motivate enough people to do something about the problem. The reluctance of local government is often accompanied by the unwillingness of state government agencies to carry out the mandate of their statutory authority to enforce water pollution control and abatement of nuisances. This enaction on the part of local and state government places pressure, therefore, on Congress for water pollution control. The author views an aroused public as the prime requisite for getting both public officials to act and for private action. Voluntary organizations supply the support that the legislator needs to favor a cause and promote legislation. Political leaders, however, must not await the initiation of action by voluntary organizations. They too can institute change by educating the public, particularly during political campaigns. Another source for positive actions can originate with the technical people and their organizations. These organizations possess detailed knowledge of water resource development problems and must speak out on the problems and make suggestions for their solution. (Starr-Chicago)
W70-00514

WATER RESOURCE INFORMATION FOR PLANNING AND MANAGEMENT,
Illinois Geological Survey.
John C. Frye.
IN Water Resources Planning in Illinois, Illinois Board of Economic Development, Illinois Conference on Water Resources Development, p 40-42, 1964.

Descriptors: *Illinois, *Water resources development, Geologic investigations.
Identifiers: *Illinois State Geological Survey, *Water resources planning.

Described are the general responsibilities and program of public service of the Illinois State Geological Survey. Physical data supplied by this state agency serves as an aid to planning groups throughout the state. Examples of surveys and services carried on by the agency are: (1) survey of economic resources for the Division of Industrial Planning and Development; (2) survey of water resources planning for the Water Resources Committee of the State Chamber of Commerce; (3) served as member of the Technical Advisory Committee on Water Supply and Waste disposal of the Northeastern Illinois Planning Commission; (4) investigated the geologic problems of Northeastern Illinois as part of a water resource study; and (5) conducted a geologic survey for the Board of Economic Development for a state-wide water resources development plan. The future program of the agency will include more integrated geologic studies that will be of assistance for pollution and contamination control, mineral resource development, design of civil works, and land use. These studies go beyond the immediate problem of water resources to the broad field of basic data for regional planning for economic growth. (Starr-Chicago)
W70-00515

UNITED STATES RIVER TREATIES,
For primary bibliographic entry see Field 06E.
W70-00518

THE TERRITORIAL SEA: A QUEST FOR UNIFORMITY,
For primary bibliographic entry see Field 06E.
W70-00519

THE GREAT POND ORDINANCE--COLLECTIVISM IN NORTHERN NEW ENGLAND,
For primary bibliographic entry see Field 06E.
W70-00522

WATER AND WATERCOURSES--RIPARIAN RIGHTS AS APPLIED TO ARTIFICIAL WATERCOURSES,
For primary bibliographic entry see Field 06E.
W70-00523

CONCURRENT JURISDICTION OF A NAVIGABLE BOUNDARY RIVER.
For primary bibliographic entry see Field 06E.
W70-00524

CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
For primary bibliographic entry see Field 06E.
W70-00526

IOWA WATER LAW: PROBLEMS TO BE CONSIDERED.
For primary bibliographic entry see Field 06E.
W70-00573

QUALITY IN THE CONTROL OF QUANTITY,
California Univ., Berkeley.
For primary bibliographic entry see Field 06G.
W70-00606

RESOURCE QUALITY AND VALUE OF THE LANDSCAPE,
California Univ., Berkeley.
For primary bibliographic entry see Field 06G.
W70-00607

PROBLEMS OF QUALITY AND QUANTITY IN THE MANAGEMENT OF THE LIVING RESOURCES OF THE SEA,
California Univ., San Diego, La Jolla.
For primary bibliographic entry see Field 06G.
W70-00608

THE QUEST FOR QUALITY IN THE ADMINISTRATION OF RESOURCES,
California Univ., Berkeley.
For primary bibliographic entry see Field 06G.
W70-00610

ON SOME MEANINGS OF 'PLANNING',
California Univ., Berkeley.
For primary bibliographic entry see Field 06G.
W70-00611

COMMENT ON THE PLACE OF WATER RESOURCES PLANNING IN ECONOMIC REGIONAL DEVELOPMENT,
Northwestern Univ., Evanston, Ill.
Robert S. Gemmell.
IN The Fresh Water of New York State: Its Conservation and Use, p 182-183, Wm C Brown Book Co, Dubuque, Iowa, 1967. 2 p. Edited by Lauren B. Hitchcock.

Descriptors: *Planning, Economics, Investment, Water resources development, Census, Water quality, Costs, Prices.
Identifiers: *Economic regional development, Water resource planner, Regional planner, Regional development, Social overhead capital, Water quantity.

Water resources planning plays a diffuse role in economic regional development. It is an essential activity, but its contribution is difficult to ascertain. Consequently, the water resources planner must be prepared to serve as advisor to the regional planner. He must assist in the formulation of the water resources portion of the regional development plan. Such a plan, however, is not static; it is evolutionary. As such, the water resources planner must devise numerous schemes for development of this resource and make known to the regional planner the consequences of implementing these schemes. He must prepare a 'catalog of merchandise' so that the regional planner can shop intellectually and purchase those items which best serve the region's economic and social interests. (Loeb-Rutgers)
W70-00614

EFFICIENCY IN GOVERNMENT SPENDING,
Netherlands School of Economics, Rotterdam.
W. Dress.
Public Finance, Vol XXIII, No 1-2, p 1-47, 1967.

Descriptors: *Government, *Budgeting, *Cost-benefit analysis, Taxes, Prices, Costs, Economic analysis, Values, Economic efficiency, Income, Debt, Conservation, Water resources, Financing, Roads, Education, Agriculture.
Identifiers: *Public finance, *Spending, Stabilization program, Budgeting, Collective goods, Income transfers.

This study is concerned with the evaluation of the area of public finance. The ideas governing expenditures, the concept of maximizing a social welfare function and the distribution of income are among the topics discussed. Program budgeting is studied and a significant section is devoted to the role of cost-benefit analysis. The section on collective goods discusses the economics of such areas as defense, police protection, conservation, basic research and foreign aid. The chapter on infrastructure contains a section on water resources relating the state of the art of public finance in that area as well as some of the problems. Income transfers are discussed, the concept of elasticity in the area is explained along with the different types and aims of income transfers. In addition to the section directly devoted to water resources, much of the theory of public finance applied to other areas has application in the public water resource area. (Murphy-Rutgers)
W70-00615

RESEARCH GOALS AND PROGRESS TOWARD THEM,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W70-00619

ANTICIPATING THE NATIONS NEED FOR ECONOMIC KNOWLEDGE,
National Bureau of Economic Research, New York.
Geoffrey H. Moore.
46th Annual Report, National Bureau of Economic Research, p 1-5, June 1966. 5 p.

Descriptors: *Economics, *Forecasting, Government, Measurement, Employment, Prices, Costs, Profits, Data collections.
Identifiers: *National Bureau, *Economic research, *Research policies, Business cycles, Borrowing.

The article seeks to explain the role of economic research in anticipating the nation's needs for basic information. The significant results of economic research are usually realized in the distant future. The author gives some examples of research which proved very useful a considerable time after its completion. The author tells of Thorp's work on business cycles as a prime example and briefly describes four recently published works that are likely to find important application in the years to come. The research policies of the National Bureau are described as an example of ones which provide the necessary soundness as well as flexibility. The large amount of economic research necessary for present and future water resource problems necessitates the understanding of the purposes and justification of research. This article provides a general argument for extending and supporting this research. (Murphy-Rutgers)
W70-00620

GOVERNMENT RESEARCH AND DEVELOPMENT PROGRAMS,
Princeton Univ., N.J. Dept. of Economics.
Frederick M. Scherer.
Measuring Benefits of Government Investments, Washington, The Brookings Institution, p 12-70, 1965. 59 p, 5 fig, 3 tab, 48 ref. Edited by Dorfman, R.

Descriptors: *Research and development, *Federal government, *Economic analysis, Investment, Risks, Benefits, Costs, Decision making, Income, Budgeting.
Identifiers: *Tradeoffs, *Cost-effectiveness, Market, Substitution, Marginal returns, Utility function, Time-cost.

This article deals with two distinctive aspects of government research and development programs. The first aspect concerns itself with the intangible benefits of such programs which are difficult to assess in a monetary common denominator. The second aspect concerns research and development investment decisions which encompass 'tradeoffs' that have few close parallels in non-research activities. This article examines the problem of measuring research and development program benefits in a nonmarket environment, emphasizing the role of benefit estimates in time-cost tradeoff decisions. A convex development possibility function is assumed in an attempt to gain better information on the benefits and costs of research and development programs since such information would lead to improved resource allocation decisions. Due to the importance of benefit evaluation in the water resource field, this article is of interest to the water researcher. (Murphy-Rutgers)
W70-00621

MEASURING BENEFITS OF GOVERNMENT INVESTMENTS.
Harvard Univ., Cambridge, Mass.

Washington, DC, The Brookings Institution, 1965. 429 p. Edited by R Dorfman.

Descriptors: *Government, *Investments, *Resource allocation, Accidents, Cost-benefit analysis, Capital, Costs, Decision-making, Federal government, Public health, Income, Marginal cost, Pricing, Measurement, Recreation, Research and development, Taxes, Transportation, Urban renewal, Water resources, Welfare economics, Government supports.
Identifiers: *Subsidies, *Development programs, Public expenditures, Land Water Conservation Bill, Time-cost tradeoff.

This book is a compilation of papers and discussions designed to explore the problems of appraising the benefits that are likely to accrue from proposed public investment projects. The areas covered include research and development expenditures, outdoor recreation projects, education programs, federal aviation, highways, urban renewal and public health programs. The general feeling was that benefits of such government investment projects could be appraised objectively and even quantitatively. This was based on skillful application of benefit-cost analysis, which had been developed in the past thirty years mostly for application to water resources development. Both because of this factor and due to the fact that other methods of benefit evaluation pertinent to water resources are presented, this book is of special use to the water resource researcher. (See also W70-00623). (Murphy-Rutgers)
W70-00622

OUTDOOR RECREATION,
Institute of Public Administration, Washington, D.C.; and National Planning Association, Washington, D.C.
Ruth P. Mack, and Sumner Myers.
Measuring Benefits of Government Investments, Washington, The Brookings Institution, p 71-116, 1965. 46 p, 2 tab, 28 ref. Edited by R Dorfman.

Descriptors: *Recreation, Cost-benefit analysis, *Measurement, *Forecasting, Mathematical studies, Market, Government, Conservation, Resources, Shoreline, Prices, Swimming, Lakes, Public lands, Investment, Input-output analysis.
Identifiers: *Merit-weighted user days, *Utility, *Dollar measure, Beach clubs.

This article explores concepts and methods for providing a useful measure of the benefit derived from government expenditure on outdoor recreation. Such benefits are measured in terms of merit-weighted user-days of outdoor recreation. Two ways are discussed of attempting to arrive at an estimate of current benefit to be derived from a given amount of current expenditures on outdoor recreation. The dollar value approach is limited for intra-program analysis, since market prices are least suitable where most needed and the price/benefit relationship is uneven for different types of recreation and people. This approach becomes more valuable if user-prices are charged for public recreation facilities. The approach of a measure in terms of a merit-weighted service unit seems to improve intra-program decisions, since it can utilize hard information and can accommodate value judgments about noncommensurables. Inter-program comparisons are also aided by this approach. Due to the important relation between water resources and outdoor recreation, this article is of interest to water resource researchers concerned with benefit measures for water oriented recreation projects. (See also W70-00622). (Murphy-Rutgers)
W70-00623

REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
Illinois Univ., Urbana; and International Rice Research Inst., Los Banos (Philippines).
For primary bibliographic entry see Field 03F.
W70-00624

OPERATIONAL PROCEDURES FOR EVALUATING FLOOD PROTECTION BENEFITS,
Department of Agriculture, Washington, D.C.; and North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 06F.
W70-00625

IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
Central Michigan Univ., Mount Pleasant.
For primary bibliographic entry see Field 03F.
W70-00627

THREE ESSAYS ON THE STATE OF ECONOMIC SCIENCE,
Tjalling C. Koopmans.
New York, McGraw-Hill Book Company, Inc, 1957. 231 p.

Descriptors: *Economics, *Resource allocation, *Mathematical models, *Mathematical studies, Measurement, Statistical methods, Statistical models, Profit, Supply, Prices, Equilibrium, Income, Economic efficiency, Linear programming, Input-output analysis, Time, Capital interest, Methodology, Psychological aspects, Model studies, Return to scale, Sites, Decision making, Risks, Preferences.
Identifiers: *Economic knowledge, *Price system, Economic theory, Empirical investigations, Mathematical concepts, Statistical concepts, Mathematical economics.

This volume is composed of three essays which are concerned with questions of substance, of method, and of tools in the area of economics. The author offers an explanation of some recent developments in economic theory, comments on the character and the basis of economic knowledge, and offers his ideas about the possible direction of future work in theory and in empirical investigations. The essays concern the parallel development of economic theory and economic observation and measurement in order to increase man's understanding and society's control of economic conditions. More particularly, they concern the development and use of mathematical and statistical concepts for these purposes. The first essay attempts to communicate the logical content and some of the underlying reasoning of certain recent developments in mathematical economics. The second essay urges a clearer separation, in the construction of economic knowledge, between reasoning and recognition of facts. It recommends the postulational method as the principal instrument of separation. The essay further explores various directions in which the postulates of economic theory could be modified and refined in order to recognize more aspects of reality. The third essay considers the interaction between tools of analysis and the choice of problems in economics. As such, this book presents numerous points of interest to the general economist including those individuals involved in theoretical and empirical treatment of water resources. (See also W70-00631 and W70-00632). (Loeb-Rutgers)
W70-00630

ALLOCATION OF RESOURCES AND THE PRICE SYSTEM,
Yale Univ., New Haven, Conn.
Tjalling C. Koopmans.
IN Three Essays on the State of Economic Science, McGraw-Hill Book Co, Inc, New York, p 1-126, 1957. 126 p, 41 fig.

Descriptors: *Economics, *Resource allocation, Profit, Supply, Prices, Equilibrium, Income, Economic efficiency, Linear programming, Input-output analysis, Time, Capital, Interest.
Identifiers: *Price system, *Point sets, *Linear space, *Convexity, Linear function, Consumption, Decentralization, Incentives, Convex sets, Free entry, Horizon.

Recently, new applications of mathematics to the field of economics have provided the economist with additional tools for economic analysis. The essay argues that the common logical structure of received economic theories of diverse origin can be developed with the help of more fundamental mathematical tools. In Section 1 of this essay the author explains the concept of a linear space and its use in describing any commodity bundle by a point in such a space. Since a restraint on choice is then suitably described by a set of points, the author reviews a few concepts and theorems of point sets in linear spaces that are useful in economic theory and illustrate their application. The first concept to be discussed, that of summation of sets, provides a tool for translating restraints on individual choices into limitations on their aggregate effects, and for showing that profit maximization at given uniform prices can under suitable conditions be decentralized. The second concept, that of convexity of a point set, allows the author to formulate conditions with regard to technology and preferences that ensure the existence of a price system which sustains decentralized optimizing production and consumption decisions. These concepts are then used in combination for the description of competitive equilibrium and the analysis of its optimality properties for the further study of productive efficiency under constant returns to scale and its relation to the price system and for the study of allocation of resources over time. This type of analysis is useful in the water area due to the increased use of mathematical models for water planning decisions. (See also W70-00630). (Loeb-Rutgers)
W70-00631

THE INTERACTION OF TOOLS AND PROBLEMS IN ECONOMICS,
Yale Univ., New Haven, Conn.
Tjalling C. Koopmans.
IN Three Essays on the State of Economic Science, McGraw-Hill Book Co, Inc, New York, p 169-220, 1957. 52 p.

Descriptors: *Economics, Mathematical studies.

Identifiers: Problems, Economic dynamics, Computing techniques, Management science, Statistical inference, Economic behavior, Sample survey, Tool developments, Research.

When we set about defining a field of scientific inquiry, such as economics, we identify a class of phenomena to be studied. For instance, in defining descriptive economics, we may say that we study the satisfaction of wants in human society. The particular formulation of such a definition is of no great importance and other forms may be more accurate or more informative. However, we observe that the definition specifies only the problems to be studied and not the tools of observation and analysis to be applied to these problems. In principle, tools have a servants status. The best choice of tools depends on the problem area selected and on the extent to which at least partial answers have been found. The tools that should be developed for future use depend on the precise nature of the problems that seem most likely to be demanding or promising further answer. If we look with a historian's interest at the development of a science, however, we find that tools also have a life of their own. They may even come to dominate an entire period or school of thought. The availability of certain tools may lead to an awareness of problems that can be solved with their help. Tools may thus become a guide to research. In any case changes in tools and changes in emphasis on various problems go together and interact. The essay examines four recent and current tool developments and seeks to perceive some of their implications for future research. The essay is relevant to the water area in respect to the development of tools such as mathematical and statistical techniques which are currently applied to the water area in an extensive manner. (See also W70-00630). (Loeb-Rutgers)
W70-00632

WATER-RESOURCES ENGINEERING,
For primary bibliographic entry see Field 06D.
W70-00634

THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
M. M. Kelso.
International Conference on Arid Lands in a Changing World, June 3-13, 1969, University of Arizona, Tucson, 1969. 22 p, 3 ref.

Descriptors: *Arid lands, *Natural resources, *Economics, *Agriculture, Mineral industries, Irrigation, Elasticity of demand, Mexico, Income, Population.
Identifiers: *Economic growth, *Per capita income, *Western U.S., Australia, South Africa, Amenity resources.

The author discusses opportunities for and constraints upon self-generating economic growth in arid regions of the world. Economic growth is defined in per capita income terms. Arid and semiarid regions of the world are all hinterlands to some industrial market-economy heartland and they are all largely dependent on natural resource-based primary production for their economic growth. Those areas will be favored which (1) contain a diversity of natural resources permitting advantage of a wider range of demands; (2) are close linearly, economically, and culturally to their industrial heartlands; (3) are free of strong barriers imposed by nation-state boundaries; and (4) are not burdened already with over-population or cultures poorly adapted to functioning smoothly in larger market economics. Most of the arid areas of the world face severe restraints to attainment of internal self-generating growth. Agriculture in these arid regions requires irrigation to produce those crops which are good growth stimulators. Frequently a water supply is lacking or will require large capital to develop or may already be 'locked up' by the indigenous population. Amenity resources emerge rather late as bases for economic growth owing to their cultural distance at early stages of development. (Crouse-Arizona)
W70-00693

STRUCTURE OF THE ARIZONA ECONOMY: OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
Anilkumar G. Tijoriwala, William E. Martin, and Leonard G. Bower.
Arizona Agricultural Experiment Station, Tucson, Technical Bulletin 180, Nov 1968. 33 p, 18 tab.

Descriptors: *Input-output analysis, *Economics, *Arizona, *Water requirements, *Water values, Industrial water, Economic prediction, Arid lands, Agriculture, Model studies, Labor supply.

The 'Leontief' system of input-output accounts is used to develop quantitative estimated of interrelationships of the complete economy of Arizona. Part I of this report describes the model in some detail. With supplementary data, output requirements from each industry can be translated into requirements for primary resource needs such as water - an important consideration in arid Arizona. Primary resources are basic factors of production, the total quantity of which may not be increased in response to additional requirements. Water intake coefficients are developed which represent the quantity of water required by each sector to produce $1,000 of output. An increase in feed grains and food production would take 42 acre feet of additional water input per $1,000 of output, compared with .21 acre feet required per $1,000 increase in output in the utilities sector. Value added per acre foot of water intake is $13.52 for the food and feed grains sector, but is $140,331.18 for the fabricated metals and machinery sector. These and other coefficients developed in the analysis are discussed in terms of their implications for economic growth in Arizona. (Crouse-Arizona)
W70-00697

THE WATER RESOURCES OF CHILE; AN ECONOMIC METHOD FOR ANALYZING A KEY RESOURCE IN A NATION'S DEVELOPMENT,
Resources for the Future, Inc., Washington, D.C.
Nathaniel Wollman.
Baltimore, Johns Hopkin's Press, 1968. 279 p, 4 fig, 1 map, 102 tabs, 31 ref, 3 append.

Descriptors: *Water resources development, *Future planning (Projected), *Water utilization, Competing users, Crop production, Mineral industry, Reasonable use, Water conservation, Distribution patterns, Irrigation practices, Water demand, Water management (Applied), Water quality, Water pollution, Administrative agencies, Appraisals, Decision making, Arid lands, Estimating, Geographical regions, Desalination, Long-term planning, Regional analysis, Water law, Economic feasibility, Human population.
Identifiers: *Chile.

The main objective of this book was to workout a methodology for careful planning and programming of a national water development program, within the framework of general economic and social planning, adaptable to any country. Subjects treated are geography, the projection model, a general survey of agriculture, use of water for irrigation, experience with government irrigation projects, projection of agricultural water use, mining and electric power, manufacturing uses of water, municipal water use, waste treatment and dilution, total water requirements, the cost of water, the effect of water shortage, the question of water quality, and effects of variations on the system. Each subject or problem is treated as a part of the entire social economic system and the expected results of certain programs are predicted. Lack of adequate data for rational decision making is discussed and areas of greatest need are indicated. (Sherbrooke-Arizona)
W70-00699

WATER RESOURCES PLANNING IN AUSTRALIA,
Adelaide Univ. (Australia). Faculty of Architecture and Town Planning.
F. D. Wallace Van Zyl.
Tijdschrift voor Economische en Sociale Geographie Vol 58, No 6, p 306-315, Nov-Dec 1967. 5 fig, 11 ref.

Descriptors: *Multi-purpose projects, *Regional analysis, Recreation, Precipitation (Atmospheric), Erosion control, Irrigation systems, Resource development.
Identifiers: *Australia, *Snowy mountains, Ord River, Regional planning.

Most of Australia's great inland area is arid, and even in the far north where rainfall is relatively high it is concentrated during the monsoon season, with water in short supply during much of the remaining year. For the most part the area in which precipitation exceeds evaporation is limited to a narrow belt of 50-150 miles in width along the coasts. The struggle between urban-industrial and agricultural users has begun. Much of the continent's vast soil and mineral resources remains undeveloped for the lack of water. Water resource development in Australia has been characterized by a lack of integration. Power and water development has been correlated with local agricultural planning as exemplified by the Snowy Mountains Scheme, but seldom with mineral, industrial or national agricultural development. Future water projects should be undertaken only in light of overall national resource planning including adequate economic analysis. In some cases planning should be on an international regional basis since much of northern Australia lies closer to Indonesia and Southeast Asia than to the heavily developed areas of southern Australia. (Crouse-Arizona)
W70-00704

OPTIMUM INESTMENT IN STRUCTURAL FLOOD CONTROL,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
William Whipple, Jr.
Jour Hydr Div, Am Soc Civ Engrs, Paper 6238, HY 6, Vol 94, p 1507-1515, Nov 1968.

Descriptors: *Flood control, *Flood plain zoning, *Optimization, Cost benefit analysis, Economic evaluation, Floods.
Identifiers: *Economic site advantage, *Project-induced economic growth, Project induced damages.

National flood damages have been increasing, despite extensive construction programs, due largely to economic encroachments on the flood plain. This situation calls for a reconsideration of flood control economics. Much of this encroachment occurs as a result of the areas being protected by flood control projects, which results in project-induced economic growth. The flood damages resulting to project-induced growth are negative benefits; but there is also an economic site advantage due to the development in these particular locations. When analysis takes these aspects into consideration a higher degree of protection will be found marginally justified; and partial protection will be shown to be much less advantageous. Basin-wide reservoir systems inherently involve extensive partial flood protection, due partly to the extension of effects downstream and partly to the continual economic development in flood plain areas lower than those to which adequate protection is afforded. Therefore, some way must be found to control project-induced growth downstream, as an adjunct of reservoir systems. This could be done by general reservation of floodways downstream of flood control reservoirs.
W70-00729

ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
For primary bibliographic entry see Field 05G.
W70-00730

URBAN DESIGN STUDY OF THE HONOLULU WATERFRONT.

Oahu Development Conference, Oct 1968. 40 p, 39 fig, 4 photo, 18 ref.

Descriptors: *Urban renewal, Design criteria, Recreation demand, Recreation facilities, Aesthetics, Harbors, Inland waterways, Tourism, Hawaii.
Identifiers: Honolulu, Oahu.

The purpose of the study is to analyze conflicting demands on the Honolulu waterfront. A seven-mile section of the waterfront was selected for study. Proposals for development include: (1) trebling the present capacity of the Honolulu International Airport by 1985; (2) enlarging the water sports facilities in Keehi Lagoon; (3) developing and enlarging Sand Island as an industrial park for port-related industry, marine repair facilities, an airport fuel storage depot, and a sewage plant; (4) developing an Inter-Island Ferry Terminal related to the downtown transportation network; (5) linking Chinatown, Downtown and the Civic Center with the waterfront; (6) extending Fort Armstrong peninsula to include a Food Distribution Center, University of Hawaii Oceanographic Center and a new location for the U.S. Bureau of Commercial Fisheries; (7) developing Kewalo Basin to accommodate more shops and restaurants to meet growing demands related to tourism; (8) developing Magic Island to include additional public facilities; (9) rebuilding Waikiki beaches to provide new public facilities and accessways; (10) planning for coping with traffic congestion in Waikiki; and (11) hotel and apartment development close to Diamond Head. The three fundamental development policies of this study are aimed at developing Waikiki primarily for the visitor and casual resident. These policies are: (1) adequate transportation facilities to and from the airport and pleasant pedestrian access-ways to the beaches and other recreational facilities; (2) preserving the aesthetic value of Diamond Head and the Ala Wai; and (3) reducing unrelated automobile traffic. (Starr-Chicago)
W70-00750

COORDINATION OF URBAN PLANNING AND FLOOD PLAIN DEVELOPMENT,

Eugene O. Johnson.
IN Flood Plain Management, Iowa's Experience, ed Merwin D. Dougal (Iowa State University Press, 1969), p 103-111. 1 fig, 11 ref.

Descriptors: *Water management (Applied), *Flood control, *City planning, Land use, Flood plain zoning, Non-structural alternatives.
Identifiers: *Duck Creek, Davenport, Iowa, Flood plain management.

This article discusses efforts to combine management and controlled flood plain use in a 'middle of the road' approach to solving problems of flood plain occupancy in Davenport, Iowa. A brief history of flood control measures and plans since 1918 is given. By 1965 two very different approaches were proposed as solutions to the problem. The Corps of Engineers proposed leaving the entire 100 year flood area in open space use; the second approach was creation of a pilot channel and improved floodway. Both proposals had drawbacks and met with public opposition. A compromise program was finally evolved through coordination of the Corps of Engineers, the INRC, and the City of Davenport. It called for confining a design flood within the area that would normally be inundated by a flood of 10 year frequency. Land fill elevations were established that would place any future structures above the control elevations. Regulations were to be enforced through flood plain zoning of two types: (1) a channel district which would be confined to open space uses, and (2) a flood plain district in which construction would be allowed in accordance with zoning and elevations ordinances. Administration, enforcement, and control would rest with the local governing body. This program, although it was legally sound and seemed to meet all requirements of the various agencies involved, failed to gain public acceptance. In conclusion, without coordination, development of adequate solutions for flood plain management and flood control is difficult to achieve. Also, it is necessary to familiarize political representatives in city government with the overall program in order to gain public support. (Marriott-Chicago)
W70-00751

THE INTERACTION OF URBAN REDEVELOPMENT AND FLOOD PLAIN MANAGEMENT IN WATERLOO, IOWA,

John R. Sheaffer.
IN Flood Plain Management, Iowa's Experience, ed by Merwin D. Dougal (Iowa State University Press, 1969), p 123-135. 3 fig, 11 ref.

Descriptors: *Water management, *Flood control, *Multiple-purpose projects, Urban renewal, Land reclamation, Recreation, Area Redevelopment, Economic efficiency, Benefits.
Identifiers: *Waterloo, Iowa, *Flood plain management.

The interrelation of flood problems and other urban deficiencies is illustrated by an analysis of Waterloo, Iowa; a city of 75,000 that is bisected by the Cedar River. Associated with Waterloo's flood problems were acute land and water resource management problems which were of great economic importance to the area. A traditional single-purpose construction solution was proposed by the Corps of Engineers but was found to be unacceptable because although it would control the 100-year flood water it would do nothing to mitigate the other problems also present. Instead, the community sought a complex metropolitan-area water management strategy. A decision was made to join two major but separate national domestic efforts--flood control and urban renewal--into an integrated urban program. A flood control project was devised that would emphasize preservation and reclamation of the esthetic and environmental qualities of the Cedar River, would eradicate slums and blight, create new public and private uses of land, and restore the diagonal belt of deterioration which bisected Waterloo. The complex multipupose plan called for modifications of the Corps plan which are discussed in some detail. Benefits of the modified program include lowering of costs, improved environmental quality, stimulation of new economic growth, and a shorter time to complete the project. (Marriott-Chicago)
W70-00752

THE ILLINOIS STATE PLANNING PROGRAM,

Illinois State Board of Economic Development.
Guy Kelnhofer.
Water Resources Planning in Illinois, Illinois Board of Economic Development, 1964. p 39.

Descriptors: *Water resources planning, *Water resources development, Coordination, Future planning.

The statewide planning program of Illinois' official planning agency, the Board of Economic Development, is described. Beginning with studies of the population and economic prospects of the State and its regions, an inventory and analysis of the State's public works expenditures, and a preparation of a plan for the development and management of the State's water resources, future work programs will be undertaken. These will include statewide planning for outdoor recreation, transportation, land use, natural resources, and capital budgeting. The objectives of the board's statewide planning program are: (1) provision of an advance warning of impending changes in the economy of the State and in the distribution of its population; (2) preparation of plans which can serve as a basis for coordinating public and private development activities in an area; (3) definition of the State's interests in certain important areas; (4) maximization of returns on State investments in public facilities; and (5) organization of a system of data collection. Through development of a planning program which meets these objectives, the Board can provide State officials with the information necessary to implement courses of action to meet expected future problems. (Starr-Chicago)
W70-00753

ILLINOIS PLANNING STUDIES AND COORDINATING ACTIVITIES,

Illinois State Board of Economic Development.
Gene H. Graves.
Water Resources Planning in Illinois, Illinois Board of Economic Development, 1964. p 29-30.

Descriptors: *Water resources planning, *Water resources development, Coordination, Future planning, Research and development, Water allocation, Population, Economic prediction.

The record of Illinois state agencies in carrying out broad water resources responsibilities is discussed. The role of the Board of Economic Development as a coordinating and planning agency supplementing separate agency programs is described. Specific water resources functions were assigned to the board; some derived from groups which had been abolished and others were added in order to expand the State's role in water resources. The board constitutes a formal organization for coordinating efforts and for facilitating cooperation between agencies. Another important function of the board is to participate in and review federal programs or projects. Planning is seen as a critical aspect of the board's functions. The placing of this function with the board facilitates solving the effects of population growth and of increasing industrial water use. A series of planning studies were undertaken by the board to describe the nature and distribution of water in Illinois and to describe water uses. These studies are aimed at providing a dependable adequate supply for all users. Discussed in these studies are all the levels of activity, federal, state, and local, public and private which are involved in water development and management and in providing water services. (Starr-Chicago)
W70-00754

RESEARCH PERSPECTIVE FOR SOCIOLOGICAL PROBLEMS INVOLVING WATER RESOURCES,

Utah State Univ., Logan.
Melvin L. Cotner.
IN Proceedings of the Workshop for Sociological Aspects of Water Resources Research, Held at Utah State University, Logan, Utah, April 18-19, 1968, Report No 1, Social Science Institute Series, p 47-62. 10 ref.

Descriptors: *Research and development, *Social values, Water resources development, Economic impact, Institutions, History, Planning, Political aspects, Political constraints, Institutional constraints, Legal aspects, Financing, Cost sharing.
Identifiers: *Sociology, Economic growth, Information diffusion.

The paper focuses on problems that are economic in nature but require sociological research to be dealt with adequatly. The first section discusses the relationship of resources to economic growth. Science and technology can increase the quantity and quality of resources, and so affect economic growth. To deal with the dynamic development and use of water resources created by science, we must provide an appropriate institutional system which incorporated a complete overview of resource use, trends, supplies, development possibilities, appraisals of demand, etc. The history of water resources planning is summarized. The second section discusses cultural and political influences on water resources and economic growth. Traditional and agrarian values within the social structure; sectional interests; and a complex set of laws, administrative rules, and political gerrymandering retard economic growth and present questions for the social scientist. Section 3 discusses five research topics: (1) cultural barriers; (2) non-economic mo-

tives; (3) organizational arrangements; (4) financial arrangements; and (5) legal arrangements. The section recommends indepth studies of the ordering of values that influence individuals to adopt watershed practices. It recommends research on: the information-diffusion process; alternate planning organizations; the most effective cost-sharing procedures; and term lease arrangements between a State and a private user. Related questions are suggested. (Gossen-Chicago)
W70-00755

WATER FOR PEOPLE,
Utah State Univ., Logan.
Albert H. Stevenson.
IN Proceedings of the Workshop for Sociological Aspects of Water Resources Research, Held at Utah State University, Logan, Utah, April 18-19, 1968, Report No 1, Social Institute Series, p 89-94.

Descriptors: *Water shortage, *Public health, Water resources development, Water quality control, Political aspects.

The report discusses two topics: (1) community water supply, and (2) the relationship of health to water resource development and water quality control. According to the report, 'Historically, urban water supply needs have had profound effects upon the political system in major cities. The 'have' community may force the annexation of adjacent 'have not' communities. Limited foresight in planning and development of community water systems has curtailed the growth potential of major cities even in the 1960's.' Two solutions for current urban water shortage problems are: a reduction in system leakage, and a reduction in per capita water consumption. The latter is discussed from a viewpoint of water as a commodity and implies a change in traditional water use patterns from non-metered residential use to a metered system. Either solution must be communicated to the public in non-technical terms. The relationship between health and water quality control is discussed in terms of swimming. Health officials should outline predictable results from swimming in waters of different qualities using, for example, enterococcus as measurement indicator. Mosquito problems should be considered in development of the hot irrigated western valley regions. (Gossen-Chicago)
W70-00756

POTENTIAL SOCIOLOGICAL RESEARCH IN WATER RESOURCES DEVELOPMENT,
James D. Sears.
IN Proceedings of the Workshop for Sociological Aspects of Water Resources Research, Held at Utah State University, Logan, Utah, April 18-19, 1968, Report No 1, Social Science Institute Series, p 95-103.

Descriptors: *Planning, Economic efficiency, Preservation, Attitudes.
Identifiers: *Army Corps of Engineers, Regional development, Susquehanna River Basin, Information diffusion.

The Army Corps of Engineers is undergoing a change in emphasis from planning with a single objective--economic efficiency--to using systematic analysis of alternative objectives and programs. The Corps has initiated a modified planning process with three objectives: regional economic development and environmental quality, as well as economic efficiency. Planning for the Susquehanna Basin will consider these objectives in separate plans. The Economic Efficiency Plan would satisfy needs that are economically justified by national benefits. The plan may include large main reservoirs but preclude preservation of scenery. Mine drainage control would probably be minimum. The Regional Development Plan would satisfy needs that are economically justified by a mix of uses, regional, and national benefits. Such a plan may include a greater degree of resource development and a recreation complex to stimulate regional economic development. The Environmental Quality Plan would preserve scenic rivers and other high value environmental quality features. More costly development alternatives and mine drainage control would be included. The needs to discover public attitudes and to disseminate information are discussed. The operation of the Graduate Fellowship Program, which employs selected graduate students from all fields to carry out research and analysis, is described. (Gossen-Chicago)
W70-00757

SOCIAL PROBLEMS NEEDING SOLUTIONS, STATE AGENCIES,
Idaho Univ., Moscow. Water Resources Research Inst.
Calvin C. Warnick.
IN Proceedings of the Workshop for Sociological Aspects of Water Resources Research, Held at Utah State University, Logan, Utah, April 18-19, 1968, Report No 1, Social Science Institute Series, p 115-118. 1 ref.

Descriptors: *Attitudes, Planning, Idaho, Scenery, Social values.
Identifiers: *Interest groups, Sociology, Water replacements.

The central problem of planning is that of establishing objectives. Conflicting social interests present a major difficulty in defining goals. Specific conflicting interests in Idaho include: whether scenic rivers should be preserved in a national wild rivers system, and whether a system of water replacements should be adopted. Changing social interests must also be considered in the planning process. In Idaho, reclamationists presently form a powerful interest group, and concern for clean waters is increasing. Reasons for changing interests require study. The lecture concludes that research in social science should involve studies on: (1) goals of water resource planning that will enhance the welfare of people locally, by states, and nationally; (2) the establishment of population dispersion to areas where water is readily available; (3) the quality improvement of waters and acceptance of necessary action programs; (4) social values in preserving certain scenic streams; (5) attitudes of special interest groups and their influence on possible water resource developments; (6) social attitude problems in connection with lands around water developments, along lake fronts, and along stream banks; and (7) ways of changing attitudes toward water exchanges and special replacement schemes. (Gossen-Chicago)
W70-00758

A FRESH APPROACH TO WATER LAW,
Abel Wolman.
Am Water Work Assn J, Vol 50, No 10, p 1279-1284, Oct 1958. 6 p, 3 ref.

Descriptors: *Water policy, *Water resources development, *Competing uses, *Water demand, Water allocation (Policy), Administration, Water utilization, Water requirements, Water resources, Water shortage, Legislation, Budgeting, Administrative agencies.

The recent concern over water policy and water use has resulted from several factors. First, population growth and the development of new devices requiring water have increased water use. Second, cheaper sources of water have already been preempted and development of new sources has been more costly. Third, this increased demand for water in recent years has occurred concurrently with a dry cycle of weather. The factors have caused a resurgence of competitive demands for water. These demands should be met with a rational state water program, not hastily conceived legislation. The essential elements of a sound state water program are: (1) an estimation of the magnitude of available water resources; (2) a continuing accumulation of information on the availability of the resource in specific areas; (3) an accounting process for the quality of these resources; (4) an estimate of the expected use; (5) a program of developing water resources; and (6) administrative agencies with sufficient budgets to resolve a development program. These administrative agencies should be permanent, flexible, and actively responsive to changing trends. (Gabrielson-Florida)
W70-00768

THE UNITED NATIONS AND MARINE RESOURCES,
David S. Browning.
Wm and Mary L Rev, Vol 10, No 3, p 690-704, Spring 1969. 15 p, 35 ref.

Descriptors: *International law, *International Hydrological Decade, *International waters, *United Nations, Federal government, Standards, Conferences, International commissions, Continental shelf, Marine geology, Oceans, Commercial fishing, Data collections, Treaties, Jurisdiction, Ownership of beds, Political aspects, Marine fisheries, Exploitation, Exploration, Natural resources, Legal aspects, Resource development.
Identifiers: *Territorial waters, Ocean floor.

Because of growing international interest in the exploitation of marine resources, the United Nations has become involved in discussions concerning the nature of these resources and the proper legal environment for their exploitation. By international convention the continental shelf, wherein a coastal nation may exercise its jurisdiction, is defined as extending to submarine areas under two hundred meters or less of water, or as far beyond that point as resources can be exploited. The uncertainty of this definition, as well as national claims to exclusive fishing zones up to two hundred miles, reveals a need for new international standards. With technology rapidly increasing, many of the smaller members of the United Nations fear that the oceans will become subject to a colonial-type grab by the powerful nations, resulting in an inequitable division of the sea's resources. The first manifestation of this concern was when Malta proposed a declaration and treaty concerning the reservation exclusively for peaceful purposes of the ocean floor and the use of its resources in the interests of mankind. The outgrowth of this and other recent proposals and discussions is that the U.N. has declared an International Decade of Ocean Exploration to begin in 1970. (Schram-Florida)
W70-00783

INTERSTATE COOPERATION IN RIVER BASIN DEVELOPMENT,
Lynton K. Caldwell.
Iowa L Rev, Vol 32, No 2, p 232-243, Jan 1947. 12 p, 27 ref.

Descriptors: *Interstate, *Federal jurisdiction, *State jurisdiction, *Water resources development, River basin development, History, Legislation, Conservation, Interstate commissions, Interstate compacts, Interstate rivers, Navigable waters, Judicial decisions, Navigation, Inland water ways, Pollution abatement, Irrigation, Industrial water, Administrative decisions, Community development, Federal-state water rights conflicts, Social needs, Political aspects.
Identifiers: *Interstate cooperation.

Although jurisdiction over the navigable waters of the nation has been assumed by the federal government under the doctrine of implied powers, the extent of this federal authority remains indeterminate. The states have always exercised certain powers over rivers and lakes within their boundaries and Congress, through approval of interstate compacts, has recognized this interest. After early efforts at interstate cooperation, the federal government began in 1879 to exercise and expand its jurisdiction over navigable waters. Growing population and the expansion of machine technology intensified the pressure on all national resources between 1910 and 1940. Governmental action was needed to improve navigation, to protect water for human consumption, to make water available for

industry, to irrigate land, to abate pollution, to drain land, to prevent floods, to conserve fisheries, and to provide for recreational uses. The federal government, able to cut across state lines, possessing greater fiscal and technical facilities, and unhampered by constitutional prohibitions, was able to move more rapidly than the states. More recently, however, states are demonstrating that the cooperative solution of regional problems can be successfully undertaken. Thus, new forms of inter-governmental organization, involving interstate-federal cooperation, are emerging to meet current needs. (Schram-Florida)
W70-00784

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COST OF MUNICIPAL SEWAGE TREATMENT,
Illinois Dept. of Registration and Education, Urbana.
For primary bibliographic entry see Field 05D.
W70-00493

BENEFIT-COST ANALYSIS FOR WATER RESOURCE PROJECTS: A SELECTED ANNOTATED BIBLIOGRAPHY,
Tennessee Valley Authority, Washington, D.C.
For primary bibliographic entry see Field 06B.
W70-00495

SOME OBSERVATIONS ON ECONOMIC EVALUATION STUDIES,
Oregon State Univ., Corvallis.
Emory Castle.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, p 68-71, Mar 1964.

Descriptors: *Benefit-cost ratio, Competing uses, Public benefits, Monetary benefits, Input-output analysis.

Non-government economists' writings have generally reached conclusions that would lead to a more conservative public investment policy in water resource development. Senate Document No. 97 is seen as favoring public as opposed to private investment; natural resource investment over other kinds of public investment; and long-term over short-term public investment. Specific provisions of the document are reviewed. Secondary benefits are usually seen as not being relevant to decision-making in the private sector of the economy so long as primary and secondary firms are independent units. In the Senate document, however, secondary benefits are defined precisely and are provided for by inclusion in the benefit-cost ratio. The author contends that secondary benefits will increase the benefit-cost ratio, while, at the same time, there are no existing means of measuring these secondary benefits or predicting their lasting effects. The pressure for public investment in water resources is such that the agencies have no alternative other than to include in their measurements of many questionable items. Economic evaluation studies must be undertaken with inadequate and imperfect tools and procedures. Suggestions are given to improve existing technique: (1) benefit-cost ratio should be recognized as only one criterion of the worth of a project; (2) benefit-cost analysis should be used to measure economic efficiency considerations primarily and not too many other objectives of public investment; (3) academic economists should be aware of the problems of economists in government agencies and yet avoid being trapped by the procedures and rules of these agencies. (Starr-Chicago)
W70-00499

SOME PROBLEMS IN EVALUATION OF WATER RESOURCES,
Washington Univ., Seattle.
James A. Crutchfield.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, p 72-74, Mar 1964.

Descriptors: Technology, Market value, Discount rate, Tangible benefits, Intangible costs, Estimated benefits.

While benefit-cost frameworks have produced significant improvement in the development and application of criteria for public investment in water resources, it is not a perfect instrument. Three areas for improvement are cited: (1) improvement of existing valuation techniques; (2) extension of these techniques to intangibles; and (3) a careful assessment of some basic assumptions underlying current measures of social benefits and social costs. Some problems of evaluation are (1) the discount rate is seen as being too low and, therefore, public investment may be slanted too much in the direction of long-lived, large scale projects; (2) the impact of technological change is another complication of the long-term investment. Short-term projects could more easily embody technological change; (3) the soundness of present methods of measuring benefits is questionable; (4) little empirical evidence that on redistribution effects of major investment programs in the water resources field; (5) present assignment of responsibility for federal water programs does not encourage consideration of all alternatives. Two general policy recommendations are given: (1) need for an independent audit of planning activities related to water; and (2) more effective use of market prices should be made to facilitate valuation procedures and administrative procedures. (Starr-Chicago)
W70-00500

AREAS OF DEFICIENCY AND RESEARCH NEEDS IN WATER RESOURCE PLANNING,
For primary bibliographic entry see Field 06B.
W70-00501

A MEASURE OF WATER RECREATION BENEFITS: THE MERAMEC BASIN EXAMPLE,
For primary bibliographic entry see Field 06B.
W70-00507

CREDIT AND COLLECTION POLICIES AT EUGENE, OREGON,
Eugene Water and Electric Board, Oreg.
J. E. Brown.
Journal of American Water Works Association Vol 61, No 5, p 234-236, May 1969. 3 p, 1 fig.

Descriptors: *Credit, *Economics, *Water utilities, Instrumentation, Computers, Public health.
Identifiers: *Collection, *Bad debt losses, Accounts receivable, Credit history, Service suspension, Collection agencies, Unemployment, Public welfare.

This article surveys the credit and collection policies of water utilities of the Water and Electric Board of Eugene, Oregon. This is of vital interest since credit is routinely given in the utility business. Economically, this industry works for 'nothing' by selling services at cost; poor credit and collection policies in this industry can easily result in working for less than nothing by selling the product and failing to collect for it. The theory in Eugene attempts to rectify this situation by reducing bad debt losses to the lowest possible level and speed the collection of receivables to free capital for production in other parts of the business. To achieve this, Eugene maintains a complete credit history of all customers, requires deposits, and suspends service for non-payment. These measures have been found necessary due to prosperity which has given false promise of ability to pay, increasing bankruptcies, family migration, unemployment programs, health plans, social security and welfare programs. (Murphy-Rutgers)
W70-00597

CONTROLLING ACCIDENT COMPENSATION COSTS,
San Diego, Calif.
J. F. Gleason.
Journal of American Water Works Association Vol 61, No 5, p 231-233, May 1969. 3 p.

Descriptors: *Accidents, *Costs, *Water works, *Claims, *Legal aspects, *Financing, *Insurance, Compensation, Management, Economics.
Identifiers: *Industrial safety, *Accident prevention, Disability awards, Loss control, Liability, Apportionment.

This article deals with industrial safety, particularly in the area of water works. For this reason, it is of interest to these working in the water resource field, especially the researcher concerned with the economics of safety. Industrial safety reflects the effectiveness of management control over accidents and accident costs, particularly evidenced since the establishment of workmen's compensation laws. Of great concern to water works management is the severity rates and costs of accidents, since these seem to rise, although overall accident rates and costs have declined. Positive loss control actions, as well as increased accident prevention measures, are greatly needed, especially in water works, to control the severity factor. Claims control, legislative persuasion, and adequate financial control are necessary to achieve these ends. (Murphy-Rutgers)
W70-00598

TAXATION AND THE DISPOSITION OF DEPRECIABLE ASSETS,
State Univ. of New York, Buffalo.
Ronald J. Huefner.
The Engineering Economist, Vol 14, No 3, p 141-150, Spring 1969. 10 p, 1 ref.

Descriptors: *Decision making, *Investment, *Taxes, Depreciation Risks.
Identifiers: *Depreciable assets, Internal Revenue Code, Depreciation deductions, Capital gains, Additional depreciation, Income tax, Depreciation method, Sale, Exchange.

The Internal Revenue Code presently provides, under Section 1245 and 1250, for the 'recapture' of depreciation deductions, by taxing certain gains from the sale of depreciable assets at ordinary income rates. Section 1245 covers depreciable assets with the exception of buildings and their structural components. Upon disposition of Section 1245 assets, the gain is taxable at ordinary rates, to the extent of the amount of depreciation claimed since January 1, 1962 and any remainder at capital-gains rates. Section 1250 covers depreciable real property and provides that, upon the early retirement of such assets, the gain will be taxed as ordinary income, to the extent of a portion of any 'additional depreciation' deductions after January 1, 1963. The portion of this additional depreciation which is subject to ordinary income-tax rates is 100 percent less one percentage point for each full month the asset is held over twenty months. The author considers, first, the effect this tax provision should have upon decision-making with respect to several aspects of depreciable assets and secondly, the effect upon investment decisions in general. As such, this should be applicable to decision-making in the water area, in that methods and timing of the replacement of water facilities would be influenced by the present tax policies. (Loeb-Rutgers)
W70-00600

PRODUCTION COST FACTOR IN RATE-MAKING,
Florida Univ., Gainesville, and Northwestern Univ., Evanston, Ill.
J. P. Heaney, and R. S. Gemmell.
Journal of the American Water Works Association, Vol 61, No 2, p 102-106, Feb 1969. 5 p, 2 tab, 10 ref.

Descriptors: *Municipal water supply, *Costs, *Water rates, *Marginal costs, *Variable costs, Water works, Wells, Aeration, Sedimentation, Economics, Ground water, Economies of scale, Electric power.
Identifiers: *Incremental costs, *Water rate differentials, Plant capacity, Institutional constraints, Debt servicing, Replacement costs.

This article analyzes the production cost component of water utility costs and investigates its role in establishing rates. (The cost of producing water is increasingly important for many communities because of growing scarcity and pollution of existing water supply resources.) Short-run and long-run production costs were examined for the Mount Prospect, Illinois water works. The short-run analysis was to define the relationships between variable costs and actual plant output. Variable costs were found relatively constant for this utility. Where significant production cost differentials exist, the utility has a firm basis to establish water rate differentials. The analysis of production costs as the utility changed its scale of plant indicated that current rate-making practices may be inequitable to certain groups of water users if the expansion takes place where long-run incremental costs of production are increasing. Incremental production cost analysis was found useful in providing an analytical approach to the problem of incorporating the production cost component of water utility expansion into the overall assessment levied on new users. (Murphy-Rutgers)
W70-00602

COST OF CAPITAL TO THE SMALL FIRM,
California Univ., Los Angeles.
Eugene V. Brigham, and Keith V. Smith.
The Engineering Economist, Vol 13, No 1, p 1-26, Fall 1967. 26 p, 6 fig, 1 tab, 1 append.

Descriptors: *Costs, *Capital, Taxes, Debt, Marginal costs, Investment, Risks, Growth rates.
Identifiers: *Small firms, *Cost of capital, *Firm size, Investment theory, Marginal cost of capital, Investment decision, Weighted average cost of capital.

The investment theory of the firm contends that management should adjust the level of capital expenditures to the point where the marginal rate of return for investment projects is equal to the marginal cost of capital. While there has been considerable progress in determining appropriate methods for evaluating and ranking potential investments, little has been accomplished toward developing useful measures of the cost of capital to a typical firm. The cost of capital is typically treated as a known parameter when it is used as a discounting factor or as the appropriate cut-off rate. This paper is concerned with the question of how a firm's size affects its cost of capital and, thus, its capital investment. In particular, its purpose is (1) to postulate the marginal cost of capital schedule as a function of firm size, (2) to justify the postulated schedule on the basis of theoretical arguments and existing empirical studies, and (3) to suggest the implication of such a cost schedule to investment decisions made by managers of small firms. As such, this may be useful to the water planner involved with projects where an investment decision must be made as to water treatment facilities and reservoirs that would require capital financing. (Loeb-Rutgers)
W70-00616

ASSET PRICES IN ECONOMIC ANALYSIS,
California Univ., Berkeley.
Samuel B. Chase.
Berkeley, University of California Press, 1963. 153 p.

Descriptors: *Prices, *Economic analysis, Demand, Risks, Marginal cost, Investment, Government, Taxes, Debt, Elasticity of demand.
Identifiers: *Assets, Liquidity, Wealth, Consumption, Flow supplies, Capital markets.

This study is designed to clarify and emphasize the role of assets in economic analysis. It focuses on the asset pricing process and its interrelations with other economic phenomena and it is argued that these interrelations are crucial in the determination of general equilibrium conditions. The first part of the book deals with the nature of the choice people make when they decide between holding assets and consuming and its implications for the determination of asset prices. The second section of the book is concerned with exploring problems such as an alternative treatment of the connection between present and expected prices, trading costs and liquidity and the workings of the asset market. The last two chapters are of particular interest to the water researcher since they deal with the effect of government debt operations and the implications of government financial policies on demand. (Murphy-Rutgers)
W70-00626

THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
Chicago Univ., Ill.
Edward F. Renshaw.
Pages on Flood Problems, Chicago, Chicago University Press, p 21-45, 1961. 1 fig. Edited by Gilbert White.

Descriptors: *Flood damages, *Flood protection, *Flood control, *Benefits, *Costs, *Economics, Flood plains, Optimization, Flooding, Investment, Measurement, Data collection, Taxes land use, Resource allocation, Government supports, River basins, Insurance.
Identifiers: *Flood losses, *Flood loss estimation, *Subsidies, Social costs, Secondary losses.

In the first part of this paper the relationship between flood losses and flood control benefits is discussed within a context of (1) optimal regional development, (2) a case involving social costs, and (3) situations leading to a general over-development of flood-plain land. The author feels that there exists no theoretical justification for assuming a one-to-one correspondence between flood losses and benefits accruing to the community as a whole from flood prevention. In the second part, attention is focused on the measurement of flood losses. It is suggested that a number of traditional categories of losses can be ignored and that physical loss estimates can be improved with greater use of synthetic models. A six point program for improving loss estimates is presented. (Murphy-Rutgers)
W70-00628

COST ALLOCATION IN RELATION TO WESTERN WATER POLICIES,
California Univ., Berkeley.
S. V. Ciracy-Wantrup.
IN Economics and Public Policy in Water Resource Development, Ames, Iowa, Iowa University Press, p 189-208, 1965. 20 p, 14 ref. Edited by S. C. Smith, and E. N. Castle.

Descriptors: *Cost allocation, *Joint costs, *Water resource development, Economic feasibility, Cost repayment, Rates, Multiple-purpose projects, Government, Costs, Benefits, Prices, Government supports, Taxes, Industrial water, Municipal water, Irrigation, Public utilities, Water policy, Construction.
Identifiers: *Yardstick, *Form of contract, Joint product.

This article is concerned with the problem of cost-allocation in the sense of apportioning joint costs of multiple-purpose projects to individual purposes. There has usually been a connection between cost allocation and several issues such as economic feasibility, repayment, rate making, and form of contract. It is to these issues that the author hopes to apply an economic analysis although he acknowledges the problems involved in connecting these issues and cost allocation. An extensive analysis is performed on each of these issues with recommendations as to possible improvements. The article concludes with an examination of the means in which economic analysis of water resources policy can be applied to the political and legal facts of life. Reclamation laws, in particular, are receptive to the principles suggested in the article. (Murphy-Rutgers)
W70-00633

PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
Booz-Allen Applied Research, Inc., Bethesda, Md.
For primary bibliographic entry see Field 03A.
W70-00726

FRONTIER TOWN PROPERTIES, INC V STATE (CONDEMNATION VALUE OF WATER USE).

58 Misc 2d 388, 296 NYS2d 90-111 (NY Ct Cl 1968).

Descriptors: *New York, *Eminent domain, *Condemnation value, *Water utilization, Judicial decisions, Land use, Land appraisal, Land development, State governments, Water rights, Dams, Energy, Powerplants, Impounded waters, Appropriation, Ponds, Rivers, Highways, Condemnation, Relative rights, Legal aspects, Water use.

Claimant brought this action to recover compensation for land appropriated by the state in an eminent domain proceeding. Claimant contended that it also owned the right to use waters from a river located on the land in order to create an amusement park. The deed from claimant's grantor reserved all water rights and riparian rights in the river. Claimant was, however, deeded an existing dam for as long as the impounded waters were not used for power purposes or the generation of electric energy. The state contended that this restriction prohibited claimant from generating energy for any commercial use or development. If such a prohibition did, in fact, exist the value of claimant's use of the appropriated land would be substantially reduced. The court discussed the effect of the language in the deed. The court held that claimant did not have a legal right to use the water for the generation of electrical energy. The court did, however, find that claimant had the right to develop the land area bounding the impounded waters in any manner suitable for the theme park or commercial or recreational purposes, and consequently claimant was entitled to compensation. (Heckerling-Florida)
W70-00805

6D. Water Demand

THE USE OF SUBSIDIES FOR WASTE ABATEMENT,
Clemson Univ., S.C. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W70-00488

EFFLUENT CHARGES,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W70-00489

EXTERNALITIES AND THE QUALITY OF AIR AND WATER,
Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W70-00490

PUBLIC VS. PRIVATE GOODS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W70-00491

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIEN CE: CHAPTER 1 INTRODUCTION,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W70-00528

SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
Ohio State Univ., Columbus; Texas A and M Univ., College Station; and Wright State Univ., Fairborn, Ohio.
B. Lentnek, C. S. Van Doren, and J. R. Trail.
Journal of Leisure Research Vol 1, No 2, p 103-124, Spring 1969. 22 p, 6 fig.

Descriptors: *Recreation, *Water resources, *Boating, *Spatial distribution, Lakes, Land management, Economies, Time, Demand.
Identifiers: *Spatial behavior, *Nonmarket-priced phenomenon, *Geography of demand, *Consumer surplus, Water skiing, Sailing, Canoeing.

This article examines some spatial aspects of recreational boating in Ohio. The study evolved as a result of another study of nationwide outdoor recreation resources which ranked water as a primary recreation resource. Boating was concluded to be a popular water-based recreation activity, especially in the North Central region. The Ohio study encompassed varied watercraft uses, such as cruising, fishing, water skiing, sailing, and canoeing. These are the five distinct groupings by activity. The authors also found three spatially-oriented groups characterized by different propensities to travel; sailors having the least propensity and fishermen the greatest propensity to travel. These findings imply the existence of a definite spatial structure to the activity specializations of the fifteen surveyed lakes. Hopefully these findings can contribute to a conceptualization of an analytical system, based on empirical evidence which aids in understanding recreational behavior. This article is of special interest to water resource researchers since it deals quite specifically with the role water resources plan in recreation. (Murphy-Rutgers)
W70-00601

PLANT SIZING FOR A SEASONAL PRODUCT DEMAND USING A LINEAR PROGRAMMING MODEL,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 06A.
W70-00604

OPTIMAL WATER ALLOCATION: THE NORTH PLATTE RIVER,
North Carolina State Univ., Raleigh; and Chase Manhattan Bank, New York.
G. 3. Tolley, and V. S. Hastings.
Quarterly Journal of Economics, Vol LXXIV, No 2, p 279-295, May 1960. 17 p, 3 fig, 1 tab.

Descriptors: *Water resource allocation, *Optimization, Rivers, Irrigation, Investment, Water demand, Water supply, Economic efficiency, Costs, Water rights, Canals, Leakage, Water storage, Value, Planning, Water uses.
Identifiers: *Priority system.

This study seeks to determine the optimal distribution of water, taking as given the major investments that have been made in dams, irrigation canals, and other water facilities. The first part of the paper discusses the methodology for optimally allocating water supplies and shows solutions for problem situations. The problems studied are those of allocating water between power and irrigation, taking account of delivery losses along a canal and the effects of water rights. These results are used in the second part of the paper which examines water allocation in view of the interrelations of the river system as a whole. The areas above and below Lake McConaughy on the North Platte River were treated by this analysis and important malallocations were found to be associated with the unequal effects of water rights in water short years. (Murphy-Rutgers)
W70-00629

ALLOCATION OF RESOURCES AND THE PRICE SYSTEM,
Yale Univ., New Haven, Conn.
For primary bibliographic entry see Field 06B.
W70-00631

WATER-RESOURCES ENGINEERING,
Ray K. Linsley, and Joseph B. Franzini.
New York, McGraw-Hill Book Co, 1964. 654 p.

Descriptors: *Water resources, *Engineering, Planning, Water management, Investment, Water resources development, Groundwater, Runoff, Probability, Droughts, Water law, Reservoirs, Dams, Spillways, Gates, Outlet works, Open channels, Pressure conduits, Hydraulic machinery, Economics, Irrigation, Navigation, Water supply, Hydroelectric power, Drainage, Sewage, Disposal, Water quality control, Flood control.
Identifiers: Storage routing, Flood frequency, Flood formulas, Rainfall frequency, Engineering economy, River navigation.

With the world population doubling every four decades, the water resources of the world are becoming one of its most important assets. Water is essential for human consumption and sanitation, for the production of industrial goods, and for the production of food and fiber. Water is an important means of transport in many parts of the world and a significant factor in recreation. Even a valuable resource can be a hazard and excessive floods cause substantial damage and loss of life throughout the world. Water is unequally distributed about the earth, and its availability at any place varies with time. Finally, in his use of this resource, man pollutes much of the available fresh water and degrades it so that it is unfit for many uses. Skilled planning and management are necessary to achieve the level of efficiency in water use which will be required in the future. Investments in water-resources development are influenced by economic, social, and political considerations as well as the basic engineering facts. The first five chapters of this volume present the subject of hydrology. Chapter 6 discusses the legal aspects of water use. Chapters 7 through 12 discusses the physical works utilized in almost all types of water-resources projects. Chapter 13 reviews the important principles of engineering economy basic to water-management. Chapters 14 through 20 discuss the principal water uses in more detail and the final chapter summarizes the planning procedures for single and multipurpose projects. (Loeg-Rutgers)
W70-00634

STRUCTURE OF THE ARIZONA ECONOMY; OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W70-00697

WATER FOR PEOPLE,
Utah State Univ., Logan.
For primary bibliographic entry see Field 06B.
W70-00756

LAWS OF FLORIDA GOVERNING WATER USE,
Frank E. Maloney.
Am Water Works Ass'n J, Vol 47, No 5, p 440-446, May 1955. 7 p, 21 ref.

Descriptors: *Florida, *Water allocation (Policy), *Water demand, *Reasonable use, Water supply, Water law, Irrigation water, Water control, Water shortage, Irrigation, Legal aspects, Industrial water, Water distribution (Applied), Percolation, Groundwater movement, Riparian rights, Surface-groundwater relationships, Planning, Saline water intrusion, Natural flow doctrine.

Post and potential increases in irrigational and industrial demands for water in Florida, combined with increasing problems of salt-water intrusion and domestic uses, evidence a need for a re-evaluation of Florida's water laws. Most of Florida's water law is based upon case rulings. The water use rule as to watercourses is the reasonable use rule subject to a similar right of use by all riparian owners. Thus the question is whether diversion for irrigation or industrial use would be reasonable. The two faults of this rule are its indefiniteness and its failure to provide for diversion for use on non-riparian land. The law of reasonable use has been applied to ground water following a definite channel. Percolating waters are governed by the doctrine of correlative use or the doctrine of reasonable use. None of the above standards are clearly established by case law or sufficient to give a satisfactory criteria to control water use. A possible answer is to replace the case law with a comprehensive water code. The need for water planning becomes more apparent every day and the governor's citizen committee on water resources a constructive first step. (Darragh-Florida)
W70-00769

6E. Water Law and Institutions

UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA,
Minnesota Univ., St. Paul. Agriculture Extension Service.
For primary bibliographic entry see Field 05G.
W70-00430

POWERS AND DUTIES OF THE DIRECTOR OF THE DIVISION OF FISH AND GAME AND OF GAME WARDENS.

Ind Ann Stat secs 11-1301 thru 11-1309 (1956).

Descriptors: *Indiana, *Fish conservation, *Wildlife conservation, *Regulation, Legislation, Legal aspects, Conservation, Reproduction, Fish, Fish reproduction, Frogs, Mussels, Wildlife, Jurisdiction, Administrative agencies, Investigations.
Identifiers: *Penalties (Criminal), Game wardens.

The Director of the Division of Fish and Game of the Department of Conservation enforces the provisions of this act and all laws of the state enacted for the propagation or protection of game, fur-bearing animals, birds, frogs, mussels, or fish. Game wardens assist the Director in carrying out his duties. The Director and the game wardens may arrest any person who is violating or attempting to violate any provision of this act or any other law of the state enacted for the protection of wildlife. The Director and game wardens are authorized to search any vehicle or receptacle in which game may be carried and may enter upon any property for purposes of patrolling or investigating when they have good reason to believe they will secure evidence of the violation of a wildlife conservation law. The Director and his officers may at any time seize and take possession of wildlife illegally possessed and may also seize any devices used for the illegal taking of wildlife; persons found with such wildlife or such devices in their possession are subject to criminal penalties. (Keith-Florida)
W70-00431

LICENSES: NETS, SEINES, AND TRAPS.

Ind Ann Stat secs 11-1434 thru 11-1441 (1956), as amended, (Supp 1968).

Descriptors: *Indiana, *Permits, *Nets, *Fishing, Legislation, Trapping, Jurisdiction, Adjudication procedure, Fish conservation, State jurisdiction, Legal aspects.
Identifiers: Penalties (Criminal).

No person may use or set any net, seine, or trap in any waters of this state other than in waters in which such device is licensed. Such nets, seines, or traps may not be lawfully removed to a distance greater than one mile from the waters in which they are licensed for use. Any court having jurisdiction over offenses involving the protection of fish may revoke the license of an offender for up to one year. Any person fishing or trapping while having his license suspended, revoked, or denied shall be guilty of a misdemeanor. (Heckerling-Florida)
W70-00432

REMOVAL OF VEGETATION FROM WATERCOURSES.
For primary bibliographic entry see Field 04A.
W70-00437

LEVEES.
For primary bibliographic entry see Field 04A.
W70-00485

INSTITUTIONAL FACTORS AND THE TEXAS WATER PLAN,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W70-00492

PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.

SC Code Ann, secs 59-3, 59-5, 59-6, 59-8, 59-14, 59-15 (1962).

Descriptors: *South Carolina, *Electric power, *Land reclamation, *Navigation, Reforestation, River basin development, Administrative agencies, Condemnation, Land use, Land tenure, Rivers, Navigable rivers, Flood control, Drainage, Hydroelectric power, Projects, Tributaries, Public health, Public benefits, Costs, Cost allocation, Federal Power Act, Construction, Permits, Water utilization, Federal government, Watersheds (Basins).
Identifiers: Public Service Authority.

The Public Service Authority shall have power to develop the Cooper, Santee, and Congaree rivers as instrumentalities of commerce and navigation; to produce, distribute, and sell electric power; to reclaim and drain flooded lands; and to reforest river watersheds in this state. The Authority shall also have the concomitant powers necessary to the exercise of the above-mentioned powers. The Authority shall have the right to acquire, in any legal manner, any lands, waters, easements, franchises, engineering data or estimates prepared for development of the above-mentioned rivers or any other real or personal property necessary in carrying out any of its purposes. The powers of the Public Service Authority shall be exercised by its board of directors, except for those duties imposed by this chapter on the advisory board. The project authorized by this chapter is for the aid of intrastate, interstate, and foreign commerce and navigation and is designed to benefit the health, welfare, and material prosperity of all the people of South Carolina. The Authority may construct the Santee-Cooper hydroelectric and navigation project as outlined by the Federal Power Commission. The two lakes belonging to the state, constructed on the Cooper River, shall be known as Lake Moultrie and Lake Marion. (Carruthers-Florida)
W70-00496

PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.

SC Code Ann, sec 59-3 (1962).

Descriptors: *South Carolina, *Navigation, *Hydroelectric power, *Administrative agencies, Canals, Dam construction, Ditches, Drains, Forestry, Financing, Federal government, Eminent domain, Projects, Legislation.

In addition to the general powers of development of commerce and navigation, reforestation, land reclamation, and production of electric power, the Public Service Authority has the following powers: (1) to have all the attributes and characteristics of a public service corporation; (2) to acquire or dispose of any real or personal property or interest therein; (3) to build, maintain and operate canals, dams, ditches, drains, and roads, and other related structures; (4) to divert waters from the Santee River in order to impound such waters; (5) to build power houses and all other structures customarily used in the manufacture and distribution of hydroelectric power; (6) to transmit and sell such power within and without South Carolina; (7) to reclaim and drain flooded lands; (8) TO REFOREST THE WATERSHEDS OF THE Cooper, Santee, and Congaree rivers; (9) to fix, charge, and collect tolls and other charges for use of the facilities of or services rendered by the Authority; (10) to borrow money and to provide security therefore, including money from the United States Government; (11) to have the power of eminent domain; and (12) to study all undeveloped power sites and navigation projects in the state and to acquire and develop same as the need therefore may arise. Specific regulations govern the details of the issuance of notes, bonds, and other evidences of indebtedness by the Public Service Authority and the giving of appropriate security therefore. (Carruthers-Florida)
W70-00508

OREGON STATE INTEREST AND VIEWPOINT IN RIVER BASIN PLANNING IN THE WILLAMETTE COMPREHENSIVE STUDY,
Oregon State Water Resources Board.
Donel J. Lane.
IN Water Resources Management for the Needs of an Expanding Society, Seminar, University of Washington, Mar 1964. p 6-10.

Descriptors: *Water resources development, State jurisdiction, Federal-state water rights conflict, Oregon, River basin planning.
Identifiers: Willamette River Basin.

The basis for Oregon's interest in water resources planning is a section of a 1909 water code which states that 'all water within the state from all sources of water supply belongs to the public'. In 1939, the legislature created the Willamette Basin Commission which operated until 1955 when a State Water Resources Board was created. The Board was directed to undertake studies of existing water resources, existing and contemplated needs and uses of water for domestic, and industrial purposes, and for pollution abatement. These changes were all given prior to Federal recognition of the merit of conducting such studies. Two serious shortcomings exist for water resource development in Oregon: (1) the State Constitution prevents the lending of the credit of the state for water resource functions; and (2) lack of an agency at the local level with broad fiscal and legal authority to conduct comprehensive planning. (Starr-Chicago)
W70-00509

THE FEDERAL COMPREHENSIVE SURVEYS,
For primary bibliographic entry see Field 06B.
W70-00511

MAKING THE STATE AN EFFECTIVE PARTNER IN WATER DEVELOPMENT,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 06B.
W70-00513

DEVELOPING POSITIVE PUBLIC ATTITUDES FOR WATER RESOURCE DEVELOPMENT,
For primary bibliographic entry see Field 06B.
W70-00514

PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.

SC Code Ann, secs 59-5 thru 59-6 (1962).

Descriptors: *South Carolina, *Administrative agencies, *River Basin Development, *Navigation, Rivers, Flood control, Electric power, Land use, Navigable rivers, Hydroelectric power, Projects, Legislation, Water law, Water utilization, Tributaries.

The Public Service Authority shall have the right to acquire any lands, waters, riparian rights, easements, engineering data, or construction plans prepared for development of the Cooper or Santee rivers. Before such acquisition of any of the above, belonging to any private corporation previously charered to develop the Santee-Cooper project, a full report of the proposed acquisition shall be submitted to the advisory board. After a public hearing and investigation of the proposed acquisition, the advisory board files a written report with the board of directors of the Authority and with the Secretary of State. Details regarding actual purchase and/or condemnation of the proposed acquisition are set forth. The board of directors exercises the powers of the Public Service Authority, except for such duties as are imposed by this chapter upon the advisory board. Upon the appointment and organization of the Public Service Authority, it shall immediately proceed with the development and improvement of the Santee, Cooper, and Congaree rivers and their tributaries upstream to aid commerce and navigation, flood control, and the development of hydroelectric power. The Authority shall have the power to acquire or develop as early as practicable other existing power and navigation projects in the state. (Carruthers-Florida)
W70-00516

KANKAKEE LANDS.
Ind Ann Stat secs 62-605 thru 62-606, 62-611 thru 62-614, 62-617 thru 62-619 (1962).

Descriptors: *Indiana, *Channel improvement, *Drainage, Legislation, Meanders, Boundaries (Property), Rivers, River beds, Beds, Channels, River flow, Swamps, Land reclamation, Land tenure, Ditches, Assessments, Surveys, Limestones, Administrative agencies, Ownership of beds, Taxing.
Identifiers: Kankakee River, Limestone.

Title to all lands included within the meander line of Beaver Lake is confirmed in the grantees holding under a deed of the governor. All unsold lands included within said meander line shall be disposed of according to law. The state auditor may accept trust deeds to Kankakee bed lands for drainage and channel improvement purposes. The governor is to appoint commissioners to supervise the clearing of the channel. The governor is authorized to expend funds derived from the sale of swamp lands bordering the Kankakee River to improve the Kankakee River within the state. The state auditor is ordered to sell all swamp meandered lands along the river in certain named counties. The selling price may include assessments based on the benfits to the land from local drainage ditches. Upon sale, the auditor is to notify the respective local taxing authorities. (McDonough-Florida)
W70-00517

UNITED STATES RIVER TREATIES,
Ludwik A. Teclaff.
Fordham L Rev, Vol 31, No 4, p 697-726, Apr 1963. 30 p, 212 ref.

Descriptors: *United States, *Rivers, *Treaties, *International waters, Mexican Water Treaty, Riparian rights, Legal aspects, Mississippi River, St Lawrence River, Mexico, Federal government, Foreign waters, International law, Alluvium, International Boundary and Water Commission, International commissions, Navigation, Accretion (Legal aspects).

There is little customary international river law in this article. It is the general duty of riparians to conclude agreements concerning the use of an international river. Treaties to this effect date back to the twelfth century. The development of nonconventional international river law in North America is presented. Negotiations and treaties between the United States, France, Spain, Mexico, Great Britain, and Canada are discussed. Agreements concerning United States rivers are all bilateral and secure free navigation for the contracting parties, whereas treaties concerning rivers elsewhere are both multilateral and bilateral. Treaties concerning the Mississippi, United States-Canadian boundary waters, other United States-Canadian waters, and United States-Mexican rivers are discussed from the standpoint of navigation, changing river beds, and uses of water other than for navigation. Treaties of the United States with Mexico and Canada are given special attention as are treaties with nonriparians pertaining to commerce and navigation. The settlement of disputes and the termination of treaties due to war and the problems of succession are discussed. Comparisons with the European fluvial system are given brief attention. The conclusion focuses on the salient features of United States river treaties as well as the negative characteristics of the system. (Moulder-Florida)
W70-00518

THE TERRITORIAL SEA: A QUEST FOR UNIFORMITY,
Oscar Svarlien.
U Fla L Rev, Vol 15, No 3, p 333-351, Fall-Winter 1962. 19 p, 86 ref.

Descriptors: *Law of the sea, *Oceans, *International law, *International waters, International commissions, Fish conservation, Fisheries, Legal aspects, Foreign waters, Treaties, Littoral measurement, Continental shelf, Continental margin, Governments.
Identifiers: *Territorial seas.

While it is generally agreed that a nation is entitled and obliged to exercise sovereignty over its marginal seas, two central problems remain unresolved. They concern both the degree to which, and the area over which, such sovereignty may be exercised. Subject to the rights of foreign vessels to innocent passage and shelter in distress, a nation may exercise the same degree of sovereignty over its marginal waters as it exerts over its land. However, no general agreement among nations exists as to the extent of those waters. Historical precedents regarding extent are examined as are present claims by the United States, some Latin American nations, and Russia. Methods used in measuring territorial waters are discussed with emphasis on the Anglo-Norwegian Fisheries Case, (1951) I.C.J. Rep. 116. Some problems associated with the delimitation of territorial waters are the concern for national security, the traditional principle of freedom of the seas, and the conservation of fishery resources. A survey of the progress made toward delimiting territorial waters examines fishery treaties and attempts at international codification in the area of delimitation. Since the three-mile limit is unpopular with nations, a twelve-mile limit is suggested. (Marsee-Florida)
W70-00519

MUNICIPAL CORPORATIONS-WATERS AND WATERCOURSES-EMINENT DOMAIN-POLLUTION OF WATER AS A 'TAKING' OF PRIVATE PROPERTY,
For primary bibliographic entry see Field 05G.
W70-00520

LIABILITY OF LANDOWNERS FOR POLLUTION OF PERCOLATING WATERS,
For primary bibliographic entry see Field 05G.
W70-00521

THE GREAT POND ORDINANCE--COLLECTIVISM IN NORTHERN NEW ENGLAND,
Lincoln Smith.
Boston U L Rev, Vol 30, No 2, p 178-190, Apr 1950. 13 p, 45 ref.

Descriptors: *Maine, *Massachusetts, *Great ponds, *History, New England, Water law, Judicial decisions, Legislation, Federal-state water rights conflicts, Hydroelectric power, Public rights, Reasonable use, Lakes, Legal aspects, Dam construction, Relative rights, Competing uses, Eminent domain, Usufructuary right.
Identifiers: *Common law, *Public ownership, Public waters.

Basing his article on historical development rather than legal analysis, the author traces the collective theory ordinance in Maine and Massachusetts which places under public ownership all non-tidal ponds of twenty or more acres. Although contrary to both the common law and the traditional opposition to collectivism in Northern New England, this exception stems from the necessity of allowing free fishing and fowling privileges to householders in the colonial days. Extended from the mere right to use these great ponds, judicial interpretation through the years has developed this right into public ownership. The many problems that this ordinance has brought about are the main subjects of the article. Attempts by private corporations to take advantage of this public ownership have been the greatest source of difficulties in recent years. In the future, the author foresees a major conflict between federal and state authorities in relation to control and distribution of hydroelectric power from these great ponds. It is suggested that the peculiar state interest created by the great pond ordinance may give Maine and Massachusetts a bulwark of defense should Washington try to impose its authority contrary to local desire. (Schram-Florida)
W70-00522

WATER AND WATERCOURSES--RIPARIAN RIGHTS AS APPLIED TO ARTIFICIAL WATERCOURSES,
William Kramer.
U Mo Kan City L Rev, Vol 33, No 1, p 143-146, Winter 1965. 4 p, 12 ref.

Descriptors: *Missouri, *Riparian rights, *Artificial watercourses, *Mills, Competing uses, Diversion, Irrigation water, Non-navigable waters, Remedies, Water law, Judicial decisions, Artificial use, Legal aspects, Reasonable use, Relative rights.
Identifiers: *Adverse possession, *Adjacent landowners, Reciprocal rights, Injunction (Mandatory).

Bollinger v Henry, 375 SW2d 161 (Mo 1964), tests the relative rights of adjacent landowners in an artificial watercourse. The watercourse involved was a mill race which had been moved slightly onto the land of an adjacent landowner, with his permission, to straighten out a sharp curve. The adjacent landowner had pumped water from the mill race for five years and, although he could show no actual damages, the owner of the mill race sought injunctive relief from such removal. In refusing to grant this relief, the Missouri Supreme Court ruled that the adjacent landowner had riparian rights in the mill race. The court recognized the general rule that riparian rights do not usually attach to artificial waterways, but applied the exception that where owners of different parcels of land conduct water across both parcels in an artificial channel and do not define their respective interests in the water, their reciprocal rights thereto are to be measured and determined as if they were riparian owners. Reasons for this exception to the general rule are given through a historical case development. The fact that previously this exception applied only to incidents where there had been mutual participation of the landowners involved in the construction of the waterway is discussed, and possible consequences of this new decision are given. (Schram-Florida)
W70-00523

CONCURRENT JURISDICTION OF A NAVIGABLE BOUNDARY RIVER.

Md L Rev, Vol 9, p 268-281, 1948. 14 p, 54 ref.

Descriptors: *Boundary disputes, *Interstate, *Jurisdiction, *Maryland, Judicial decisions, Interstate rivers, State jurisdiction, Interstate compacts, Rivers, Navigable rivers, Boundaries (Property), River beds, Virginia, State governments, Local governments, Legal aspects.
Identifiers: Potomac River, Criminal proceedings.

Questions of concurrent jurisdiction of courts over crimes committed on navigable rivers as between two counties within a given state bordering the river and as between two states whose boundary is the river are raised in Barnes v State, 47 A2d 50 (Md. 1946). The appellant, a Virginia citizen, had been convicted in Maryland for a crime committed on a steamboat on the Potomac River. He attacked the decision alleging lack of jurisdiction in the Maryland county and lack of Maryland jurisdiction to try him. Prince George's County, Maryland, pursuant to Maryland laws giving concurrent jurisdiction to the various counties from, to, or through which a steamboat may travel, convicted the appellant following grand jury indictment. That county had exclusive jurisdiction in Maryland to try the appellant because it was the first county to assume jurisdiction. Virginia, Maryland, and the Congress, by agreement in 1877, had fixed the low water mark on the Virginia shore as the boundary between the states. Maryland therefore had exclusive jurisdiction on the Potomac for criminal offenses. The decision was affirmed on appeal to the Court of Appeals and certiorari was denied by the United States Supreme Court. (McDonough-Florida)
W70-00524

PROPERTY RIGHTS OF RIPARIAN OWNER IN MISSOURI WITH RESPECT TO OBSTRUCTION OF A NATURAL OR ARTIFICIAL WATERCOURSE,
Paul A. Hanna.
Mo L Rev, Vol 18, No 1, p 67-74, Jan 1953. 8 p, 29 ref.

Descriptors: *Missouri, *Riparian rights, *Surface waters, *Obstruction to flow, Judicial decisions, Surface drainage, Surface runoff, Land tenure, Lakes, Artificial watercourses, Natural streams, Damages, Levees, Dams, Natural flow, Legal aspects, Natural streams, Relative rights.
Identifiers: Common enemy doctrine.

In the case of Happy v Kenton, 247 SW 2d 698 (Mo 1952), plaintiff and defendants were both landowners on a natural lake. Defendants constructed a levee on their land across an outlet through which water had previously drained from the lake. Because of the levee, the water level of the lake was raised and the size of the lake increased causing damage to plaintiffs' crops. Plaintiffs contended that defendants had obstructed a natural watercourse. Defendants argued that they had only prevented surface water from flowing across their lands. The principal issue was whether defendants had obstructed a natural watercourse. There was evidence in the case that the outlet had been artificially deepened following the lines of natural drainage and that the drain was a definite channel in which water flowed most of the year. The Missouri Supreme Court held that the drain should be considered as a natural watercourse and affirmed the lower court verdict. Missouri is committed to the doctrine that one may not obstruct a natural watercourse without liability for ensuing damages to others, but that one may otherwise treat surface

waters as a common enemy and obstruct their flow without liability for ensuing damages so long as he does so reasonably and not recklessly or negligently. At least until 1953, the Missouri courts had not definitely decided on the rule to be followed in situations like the instant case. (Heckerling-Florida)
W70-00525

CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.

La L Rev, Vol 15, No 2, p 463-465, Feb 1955. 3 p, 16 ref.

Descriptors: *Louisiana, *Ownership of beds, *Navigable waters, *Public rights, Legislation, Judicial decisions, Land tenure, Patents, Leases, Water law, Beds, Beds under water, Legal aspects.
Identifiers: *Alienation of beds, Statute of limitations, Private ownership.

The title to beds of navigable waters in Louisiana has traditionally been considered to have vested in the state since its admission to the Union in 1812. Such beds are considered by the Civil Code to be publicly owned by the 'whole nation' and not susceptible of private ownership. Further, the Louisiana Constitution prohibits alienation of the beds of navigable waters. California Co v Price, 74 So 2d 1 (La 1954) apparently reverses this traditional view. In that case the plaintiff sought a determination of the ownership of royalty funds from oil wells located under navigable waters on beds leased from a private owner who claimed title based on a state patent. The court in Price held that under Act 62 of 1912 the state was required to annul the patent within 6 years or the title to beds of any navigable waters found upon the conveyed lands would pass to the private owner. Immediately after the decision, Act 727 of 1954 was enacted to overrule the court; it reiterated the public policy against alienation of beds of navigable bodies of water. The 1954 Act further interprets the Act of 1912 as applying only to land susceptible of private ownership. Considering this pronouncement of legislative intent, disputes in this area of law should be closely examined. (Harris-Florida)
W70-00526

WATER LAW AND ADMINISTRATION - THE FLORIDA EXPERIENCE,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 1, p 1-28, 1968. 6 fig, 6 tables. OWRR Project A-001-FLA.

Descriptors: *Florida, *Long-term planning, *Water resources, *Water resources development, Riparian rights, Water law, Navigable waters, Non-navigable waters, Boundaries (Property), Recreation, Docks, Consumptive use, Legislation, Permits, Surface runoff, Federal government, Administrative agencies, State governments, Water management (Applied), Water pollution control, Ownership of beds, Beds under water.

This book represents a detailed examination of Florida Water Law. The introduction sets forth general water facts and quantitative water needs of Florida. The major areas covered in the next eleven chapters are: rights in defined waterbodies--riparian rights; ownership of upland as the source of riparian rights; non-consumptive uses of natural navigable waterbodies; consumptive use of water; common law rules; statutory modification of eastern consumptive use doctrines; rights in disposal of diffused surface water; federal authority and activity affecting Florida's water resources; state administration of water resources; single purpose and multipurpose water management districts; the law and administration of pollution control in Florida; and title to beds under navigable waters. The thirteenth chapter stresses the need for water resources planning and research, both legal and extra-legal. Although Florida has, at present, enough water to meet her needs in the foreseeable future, the authors emphasize the necessity of a master plan for water resources development to insure the maximum beneficial use of this precious natural resource. (See also W70-00528 thru W70-00540). (Wheeler-Florida)
W70-00527

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 1 INTRODUCTION,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 1, p 1-28, 1968. 6 fig, 6 tables.

Descriptors: *Florida, *Statistics, *Water resources, *Water demand, Irrigation, Water supply, Water conservation, Water requirements, Water users, Hydrologic cycle, Surface waters, Precipitation (Atmospheric), Droughts, Evapotranspiration, Floods, Springs, Groundwater, Agriculture, Municipal water, Domestic water, Water quality, Industrial water, Water utilization.

The law has been slow to recognize the interrelationships among the various categories of water. However, legislative and judicial awareness of the hydrologic cycle, specifically Florida's hydrology, is now developing. In attempts to balance the water cycle, the lawmakers not only must study rainfall and drought data, but must also consider the enormous evapotranspiration rate, on which little information is available. Florida's abundant lakes and streams, flat topography, numerous springs, and large groundwater reservoirs further influence the state's particular hydrology. The easily accessible water supply of Florida should exceed the demand in the near future, provided the resource is properly managed. The quantitative needs of all users continue to increase. Ground water is the primary source of municipal supply. Predominant industrial users in Florida are electric power production, the pulp, paper, and chemical industries, citrus processing, and mining. Florida's water resources are also used extensively for navigation and widespread recreational purposes. (See W70-00527). (Wheeler-Florida)
W70-00528

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 2 RIGHTS IN DEFINED WATERBODIES BASIC CONSIDERATIONS,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 2, p 29-65, 1968.

Descriptors: *Florida, *Riparian rights, *Navigable waters, *Federal jurisdiction, Federal government, Legal aspects, State jurisdiction, Water rights, Navigation, Non-navigable waters, Ownership of beds, Riparian waters, Streambeds, Artificial watercourses, Riparian land, Legislation, Regulation, Public rights, Public lands.
Identifiers: Property rights.

Water use rights, both of upland owners and the general public, and the possibility of private ownership of submerged lands are directly affected by a waterbody's classification as either navigable or non-navigable. Riparian rights are generally recognized as property rights attaching to land bordering natural, navigable waterbodies. Florida tests navigability in terms of navigability in fact. The emphasis on navigability in commercial terms may leave recreational interests unprotected. The Florida test differs from federal law in that the former does not include an artificially created present capability. Only a fraction of Florida's lakes were meandered, and the presumption of navigability raised by the federal survey can be rebutted. Although Florida is considered to hold title to beds of navigable waterbodies in trust for its people, public rights in navigable waterbodies have been complicated by state conveyances of many such beds to private interests. Florida's legislation affecting navigability raises interpretational and constitutional problems. The distinction between artificial and natural waterbodies and the effect of the classification on public and private rights is also analyzed. The chapter includes a detailed discussion of a Florida statute which greatly implicates the determination of navigability of non-meandered Florida lakes. (See W70-00527). (Wheeler-Florida)
W70-00529

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 3 OWNERSHIP OF UPLAND AS THE SOURCE OF RIPARIAN RIGHTS,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 3, p 66-97, 1968. 1 fig, 1 table.

Descriptors: *Florida, *Riparian rights, *High water mark, *Riparian land, Severance, Legal aspects, Banks, Boundaries (Property), Water level fluctuations, Tidal waters, Fresh water, Highways, Judicial decisions, Legislation, Meanders.

Determination of whether the owner of a particular tract of land is entitled to riparian rights often poses difficult problems. Especially complex is the question of whether the tract actually abuts on a navigable waterbody. The high water mark first must be located. This procedure is much more complicated for tidal than nontidal waters. The question whether the water mark, once located, constitutes a boundary of the tract is largely a matter of interpretation of the grantor's intention. If the high water mark and a meander line are substantially coincident, the former is generally considered as the boundary. However, whenever the meander line lies substantially away from the waterbody, most jurisdictions, including Florida, treat the meander line as the boundary. Florida is confronted with troublesome decisions concerning ownership of riparian rights in cases involving platted streets which adjoin and parallel waterbodies. The issues that must be decided on a case by case basis are: (1) does the platted street reach to the water's edge; (2) who owns the street; and (3) whether compatible riparian rights are to be allocated between opposing claimants according to their interests. Several cases have tended to indicate that riparian rights may be lost by certain conveyances of riparian land. (See W70-00527). (Wheeler-Florida)
W70-00530

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 4 NON-CONSUMPTIVE USES OF NATURAL NAVIGABLE WATERBODIES,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 4, p 98-139, 1968.

Descriptors: *Florida, *Non-consumptive use, *Riparian rights, *Public rights, Navigable waters, Riparian waters, Riparian land, Streambeds, Fishing, Swimming, Navigation, Recreation, Access routes, Boating, Water sports, Shores, Docks, Landfills, Ownership of beds, High water mark, Low water mark, Beds, Water levels, Water level fluctuations, Lakes, Dams, Regulation.

Generally, riparian owners are considered to have a valuable right of access to a navigable waterbody. However, the right to navigate, of both riparians and the public, is unsettled, and may be superceded by an overriding public interest. Most courts agree that the public has no right to cross private property to reach navigable waters. Florida takes the

minority position by allowing the public the right to walk along the shores of navigable waterbodies. The right of public boating appears to be recognized in all jurisdictions. Riparians' rights to fish usually are not distinguished from the public's, but questions often arise over exclusive rights and regulation. The taking of the riparian right to swim appears to warrant compensation. Riparians appear to have at least a prima facie right to wharf, which may be denied as a result of conflicting interests. Florida does not seem to recognize any riparian right to fill for nonwharfing purposes, in the absence of statutory authority. Courts probably would not recognize a building right on navigable waterbodies based solely on bottomland ownership. Riparian rights of having a lake maintained at its ordinary level and damming watercourses are discussed. (See W70-00527). (Wheeler-Florida)
W70-00531

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 5 CONSUMPTIVE USE OF WATER: COMMON LAW RULES,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 5, p 140-171, 1968. 6 fig, 1 table.

Descriptors: *Florida, *Consumptive use, *Groundwater, *Surface waters, Surface runoff, Riparian rights, Competing uses, Domestic water, Legal aspects, Municipal water, Reasonable use, Remedies, Water utilization, Percolating water, Aquifers, Hydrogeology, Groundwater basins, Hydrologic cycle, Overdraft, Wells, Surface-groundwater relationships, Damages, Water supply, Saline water intrusion, Underground streams.

Groundwater from limestone aquifers is Florida's principal source of water for consumptive use. The basic problems of groundwater management are: (a) interference between wells; (b) overdraft of the waterbearing bed or aquifer; and (c) contamination. Salt-water intrusion is probably Florida's greatest groundwater contamination problem. Groundwater has been traditionally classified into either underground streams or percolating waters. The significance of the distinctions, however, has been reduced since most jurisdictions, including Florida, now begin with the presumption that groundwater is percolating. However, legal rights continue to hinge upon whether the problems of proof as to the existence of an underground stream can be overcome. Generally, the rights governing surface watercourses apply to underground streams, while the rights regarding percolating waters vary according to whether the common law or reasonable use rule is followed. Many courts hold that as long as the use is beneficial and reasonable, the landowner may use percolating water on overlying land even if such use injures adjoining owners. Florida, however, seemingly applies surface water riparian doctrine to percolating waters. Injunction is usually the preferred remedy respecting groundwater interference. General riparian doctrines are applicable to springs and defined surface waterbodies. With the increasing use of surface waters as a source of supply, the trend is to refine the absolute ownership applicable to such waters. (See W70-00527). (Wheeler-Florida)
W70-00532

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 6 STATUTORY MODIFICATIONS OF EASTERN CONSUMPTIVE USE DOCTRINES,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 6, p 172-197, 1968.

Descriptors: *Florida, *Consumptive use, *Permits, *Regulation, Legislation, Legal aspects, Water utilization, Iowa, Surface water, Surface runoff, Artesian wells, Riparian land, Administrative agencies, Groundwater, Competing uses, Domestic water, Prior appropriation.
Identifiers: Model water use act.

The growing realization of the weaknesses of the riparian system has initiated a trend toward water-rights legislation. Regulation of consumptive use involves the constitutional problem of compensation for any taking of a property interest. The legislative scheme in most eastern states has been to implement permit systems, operated by administrative agencies. Generally, these systems have taken one of three forms: (1) overall compulsory systems; (2) permit systems geared to the needs of problem areas; and (3) permissive permit systems. In 1957, Florida provided for a compulsory permit system in critical areas; however, such regulation is limited since it depends upon the creation of water regulatory districts to become operative. However, the experience in the Pinellas County-Hillsborough County area has demonstrated the great difficulty of regulating water users under this statute. Florida's 1957 law also provides for permissive permits for excess water, and has the apparent advantage of allowing diversion beyond riparian land. However, the law's purpose of encouraging the use of excess water has not been effective since no permits have yet been issued. Another Florida statute regulates the use of artesian wells to prohibit waste and contamination of other water supplies. The authors explore the advantages and problems of eastern permit systems. The eastern system is also compared with the western system of prior appropriation. (See W70-00527). (Wheeler-Florida)
W70-00533

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 7 RIGHTS IN DISPOSAL OF DIFFUSED SURFACE WATER,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 7, p 198-220, 1968.

Descriptors: *Florida, *Surface runoff, *Repulsion (Legal aspects), *Remedies, Damages, Lakes, Reasonable use, Alteration of flow, Ponds, Diversion, Flood control, Natural flow doctrine, Obstruction to flow, Natural streams, Floods, Marshes, Surface waters, Swamps, Civil law, Water law, Riparian land, Riparian rights.
Identifiers: Injunctions (Mandatory), Injunctions (Prohibitory), Common enemy doctrine.

'Diffused surface water' is a catch-all phrase which includes all forms of waters which do not fall within the legal classification of lakes, ponds, and natural watercourses. The problems involving diffused surface water usually concern its disposal rather than its use. The three basic doctrines governing the disposal of diffused surface water are: (1) the civil law rule, (2) the common enemy rule, and (3) the reasonable use rule. The civil law rule, in its pure form, provides that no man may interfere with the natural flow of surface waters. The strict common enemy rule, in contrast, recognizes the right of each landowner to deal as he pleases with surface water on his property without regard to the consequences of such use. The reasonable use rule provides that liability for invasion of an interest in the use and enjoyment of one's land by interference with the natural flow of diffused surface waters depends upon whether the action, if intentional, was unreasonable or if unintentional, was negligent, reckless, or ultra-hazardous. Florida appears to follow the civil law rule. The authors include a discussion of the remedies and defenses available to litigants in the area of interference with surface waters. (See W70-00527). (Wheeler-Florida)
W70-00534

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 8 FEDERAL AUTHORITY AND ACTIVITY AFFECTING FLORIDA'S WATER RESOURCES,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 8, p 221-257, 1968. 4 fig.

Descriptors: *Florida, *Federal jurisdiction, *Administration, *Watershed management, Water management (Applied), Administrative agencies, Drainage systems, Flood control, Irrigation, Water conservation, Water resources, Land management, Federal government, Legal aspects, National parks, Recreation, Navigable waters, Navigation, Water allocation (Policy), Regulation, Costs, Water distribution (Applied).

The authority of Congress to regulate waterways is grounded primarily on the commerce clause of the Federal Constitution. Federal authority extends to all waterways which are navigable. 'Navigable waterways' in this context are such waterways as are capable of supporting commerce. The federal definition of navigability covers not only watercourses navigable in their natural state, but also those watercourses capable of being improved to the extent necessary to support navigation. Once a watercourse is determined to be navigable, federal jurisdiction attaches and extends to non-navigable portions of the waterbody which affect navigability. In exercising its authority, the federal government has generally not been held liable for injury caused to private property as a direct result of the regulation and improvement of navigable waters. However, there have been exceptions to this general proposition in connection with improvement of non-navigable waters. The Small Watershed Act provides a broad, multipurpose program which includes land treatment, flood prevention, agricultural water management, and public recreational development. Federal and state costs involved in such programs are discussed. The problem of water distribution and transportation from the Central and Southern Florida Flood Control District to the Everglades National Park is examined from both a physical and legal viewpoint. (See W70-00527). (Wheeler-Florida)
W70-00535

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 9 STATE ADMINISTRATION OF WATER RESOURCES IN FLORIDA,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 9, p 258-286, 1968. 3 fig.

Descriptors: *Florida, *Administrative agencies, *Water resources development, *State governments, Legal aspects, Canals, Channels, Fishing, Fish management, Fisheries, Shores, Shore protection, Beaches, Financing, Grants, Artesian wells, Saline water intrusion, Geology, Beds, Ownership of beds, Federal government, Water pollution, Administration, Planning.

State administration of water resources in Florida is primarily the responsibility of four agencies: (1) the Trustees of the Internal Improvement Fund (management of submerged lands); (2) the Air and Water Pollution Control Commission; (3) the State Board of Conservation; and (4) the Game and Fresh Water Fish Commission. The State Board of Conservation has a multitude of functions and controls the bulk of water resources administrative decisions in the state. The various divisions which comprise the Board of Conservation include Survey and Management, Salt Water Fisheries, Geology, Water Resources and Conservation, Beaches and Shores, and Waterways Development (currently coordinating construction of the Cross-Florida Barge Canal). The structures, problems, powers, and duties of each of these divisions are

fully examined. The board also has the responsibility of coordinating and setting priorities for proposed projects of all state and local agencies. To effect such evaluation and coordination, an annual conference is scheduled at which all proposed projects for water resources development are presented and evaluated. This approach enables the board to present a unified program of water resources development to the various congressional committees to reduce harmful competition for federal funds. (See W70-00527). (Wheeler-Florida)
W70-00536

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 10 SINGLE PURPOSE AND MULTIPURPOSE WATER MANAGEMENT DISTRICTS,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 10, p 287-316, 1968. 3 fig.

Descriptors: *Florida, *Administrative agencies, *Water management (Applied), *Drainage districts, Water resources development, State governments, Legal aspects, Fish management, Financing, Grants, Saline water intrusion, Federal government, Legislation, Governments, Watersheds (Divides), Wildlife management, Irrigation systems, Flood control, Navigation, Recreation, Water conservation, Wildlife conservation, Groundwater.

Historically, single purpose water management districts were created in Florida to drain excess water from the land. Other single purpose districts in Florida include water supply districts, aquaduct districts, and mosquito control districts. Most early drainage districts were created by special acts by the legislature in 1913. The circuit courts were empowered to create drainage districts when petitioned by the State Board of Drainage Commissioners or by a majority of the landowners in a given area. The Board of Supervisors of each of these districts was given the power to construct all manner of works, to acquire needed land, and to condemn land for rights-of-way. The individual counties were also empowered to create drainage districts under separate legislation. These single purpose districts are criticized because they usually are created along political lines rather than according to natural watershed boundaries and deal only with drainage, which is but one aspect of water management. Two multipurpose water management districts have been created in Florida. The Central and Southern Florida Flood Control District has powers over flood control, water conservation, prevention of salt-water intrusion, improvement of navigation, and development of recreational facilities, including the preservation of fish and wildlife. In addition to possessing these powers of the Central and Southern District, the Southwest Florida Water Management District regulates groundwater through a water regulatory district created under the 1957 Florida Water Resources Law. (See W70-00527). (Wheeler-Florida)
W70-00537

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 11 THE LAW AND ADMINISTRATION OF POLLUTION CONTROL IN FLORIDA,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 11, p 317-345, 1968.

Descriptors: *Florida, *Administrative agencies, *Water pollution, *Pollution abatement, State governments, Legal aspects, Financing, Grants, Federal government, Legislation, Domestic wastes, Industrial wastes, Standards, Damages, Reasonable use, Remedies, Riparian rights, Public health, Permits, Agricultural chemicals, Jurisdiction, Administrative decisions.
Identifiers: Statute of limitations, Laches, Injunctions (Mandatory), Injunction (Prohibitory).

Florida's main pollution problems are domestic and industrial wastes, state authorization of pollution, and agricultural chemicals. The common law remedies have proven inadequate to control pollution. Riparian owners are hampered by the uncertainty of determination of reasonable use. Although the preventive relief by injunction is preferred over a damage action, equitable jurisdiction is more difficult to secure. Florida's tendency toward restricting permanent damage suits creates the likelihood that successive suits must be brought. Furthermore, the defenses of the statute of limitations, prescription, and laches may deny relief altogether. Due to the weaknesses of the remedies and the realization that courts lack the ability to formulate comprehensive programs, Florida utilizes primarily the administrative process for pollution control. In 1967, Florida completely revamped its pollution control program with passage of the Air and Water Pollution Control Act. This legislation placed primary jurisdiction over pollution control in the new Florida Air and Water Pollution Control Commission. The advantages of a specialized agency were augmented by providing the commission extensive powers. Permits may be required for the construction of disposal facilities, and provisions for stiff civil sanctions should overcome the weaknesses of reluctance of invoking criminal sanctions. The chief problem the new commission faces is financing, and if this and other elements of support are not secure, federal intervention appears inevitable. (See W70-00527). (Wheeler-Florida)
W70-00538

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 12 TITLE TO BEDS UNDER NAVIGABLE WATERS,
Florida Univ., Gainesville. Water Resources Research Center.
F. Maloney, S. Plager, and F. Baldwin.
Univ of Florida Press, Gainesville, ch 12, p 346-405, 1968. 1 fig.

Descriptors: *Florida, *Ownership of beds, *Navigable waters, *Legislation, Beds, Beds under water, Boundaries (Property), High water mark, Low water mark, Riparian rights, Seashores, Civil law, Legal aspects, Lakes, Rivers, Oceans, Bays, Bulkhead line, Landfills, Judicial decisions, Accretion (Legal aspects), Channels, Federal government, State governments, Grants, Meanders.

Florida law relative to ownership of beds under navigable waters requires lengthy explanation, and, even then, defies any real degree of certainty. In general, the beds of navigable waterbodies are held by the state in trust for the people. However, most of the beds of navigable waterbodies have been alienated to private interests by either the Spanish, federal, or state governments; lakes which were not meandered by original government surveyors were presumed non-navigable. However, because of the hazards and other difficulties involved, only a fraction of Florida's lakes were meandered. Therefore, the beds of most of the navigable lakes were sold due to the erroneous presumption of non-navigability. Furthermore, the law is complicated by various uncoordinated legislation which purported to divest the state of title to certain submerged lands. The Riparian Act of 1856, the Butler Bill and the Bulkhead Act and its amendments are analyzed. The Bulkhead Act of 1957 as amended provides for the establishment of bulkhead lines and sets up rules for the sale of tidal lands and the filling of submerged lands. The legal problems relative to title to land formations constantly being altered by accretion, reliction, and avulsion are also discussed. In conclusion, the authors recognize the need for formulation of new rules to protect public rights and to correct past infringements of these rights. (See W70-00527). (Wheeler-Florida)
W70-00539

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 13 A LOOK TO THE FUTURE,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W70-00540

CIVIL LAW PROPERTY--ALLUVION DISTINGUISHING LAKES FROM RIVERS AND STREAMS,
For primary bibliographic entry see Field 04D.
W70-00541

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
For primary bibliographic entry see Field 05G.
W70-00542

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
For primary bibliographic entry see Field 05G.
W70-00543

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
For primary bibliographic entry see Field 05G.
W70-00544

EMINENT DOMAIN--NAVIGATIONAL SERVITUDE--EFFECT ON EVALUATION OF PORT SITE PROPERTY,
Kenneth L. Keene.
Land and Water L Rev, Vol 4, No 1, p 200-208, 1969. 9 p, 47 ref.

Descriptors: *United States, *Eminent domain, *Compensation, *Riparian rights, Judicial decisions, Damages, Navigation, Construction, Dams, Rivers, Streams, Condemnation, Condemnation value, Evaluation, Easements.
Identifiers: Navigational servitude.

The case of United States v Rands, 88 S Ct 265 (1967), illustrates the extent to which the navigation servitude doctrine may be applied. In 1963, the United States condemned Rands' property for a river development project and did not compensate him for the value of his land as a potential port site. The United States Supreme Court upheld the ruling saying that to compensate this would be to allow additional value representing a private right in what is obviously the public domain. An examination of the relationship between the fifth amendment, eminent domain, the commerce clause, and the navigation servitude doctrine shown that generally the federal government need not compensate private riparian owners for damages resulting from condemnation proceedings concerning the flow of waters. The refusal to compensate is based upon two arguments: (1) no private property right is being taken, only a public right; (2) the government is exercising its paramount navigational power to which riparian rights have always been subject. There is a need for a change in this policy for two reasons: (1) the public should pay for that which benefits the public; (2) riparian owners are reluctant to develop their land for fear of condemnation. (Darragh-Florida)
W70-00545

INTERFERENCE WITH THE PUBLIC RIGHT OF NAVIGATION AND THE RIPARIAN OWNER'S CLAIM OF PRIVILEGE,
Sheldon J. Plager.
Mo L Rev, Vol 33, No 4, p 608-635, Fall 1968. 28 p, 116 ref.

Descriptors: *Navigation, *Riparian rights, *Public rights, *Water policy, Legislation, Judicial decisions, Damages, Access routes, Bodies of water, Navigable waters, Riparian land, Federal government, State governments, Bridge construction,

Public benefits, Structures, Upstream, High water mark, Rivers, Bridges, Legal aspects.
Identifiers: Improvements, Nuisance (Public), Nuisance (Private).

Entering and leaving a navigable body of water usually involves the use of adjacent upland. The courts may hol ' such crossing to be a trespass or it may feel that the riparian has not been injured. In cases where the government makes improvements which materially impair the riparian owner's access to the waterbody, the courts attempt to strike a balance. This area has been highly litigated. As regards the right to navigate, the riparian owner has at least the same rights as any member of the general public. The public has a protected right to navigate except when the federal or state governments require improvement of any waterway for the general good. When the navigation of a stream is impaired or cut off, whether or not the riparian may recover compensation for the loss of his navigation right depends on the type of damage he sustained. If he suffered special damages he might recover. In certain cases the state legislatures expressly authorized structures which impaired navigation, and whether the riparian was damaged was decided by the courts. However, if the structure was expressly authorized by Congress, the federal courts could not recognize any riparian right. Whether structures may be built in a navigable stream is a matter of government policy. (Heckerling-Florida)
W70-00546

OWNERSHIP OF BEDS: POWER TO CONVEY WHEN STATE HAS TITLE.

Minn L Rev, Vol 32, p 484-495, 1948. 12 p, 61 ref.

Descriptors: *Beds under water, *Navigable waters, *State governments, *Ownership of beds, Judicial decisions, Federal government, Easements, Legal aspects, Riparian land, Land tenure, Minnesota, Beds.
Identifiers: Common law.

This note analyzes the views of American courts on the problem of determining the nature and extent of the ownership of the beds of navigable waters. Under the English Common Law, tide lands were prima facie owned by the sovereign while the beds of fresh waters were owned by the riparian landowners. This view was adopted by some American courts. Other states have adopted a different view. Mostly as a result of Supreme Court decisions, it is now settled law that each of the states formed out of the public domain, on admission to the Union, took the title to the beds of all public waters except those which had previously been alienated by the federal government. The courts of some states formed out of the public domain have held ownership of beds under navigable waters to be in the riparian landowners, but have reserved a public right of passage protected by an easement. Questions of ownership of navigable water beds have generally been resolved in favor of the state, but the question of what the state may do with these beds has as yet not uniformly been answered by the courts of the various jurisdictions. The majority seems to favor inalienability of such lands. (Heckerling-Florida)
W70-00547

REAL PROPERTY--EASEMENTS--CONSTRUCTION OF INSTRUMENT GRANTING RIGHT OF FLOWAGE,
For primary bibliographic entry see Field 04A.
W70-00548

FEDERAL ENCROACHMENT ON STATE WATER RIGHTS,
Clarence A. Davis.
ABA Section of Mineral and Natural Resources Law (1959 Proceedings), p 80-92, 1959. 13 p, 14 ref.

Descriptors: *Federal jurisdiction, *Federal-state water rights conflicts, *State jurisdiction, *Legislation, Proprietary power, Water law, Treaties, Political aspects, Judicial decisions, Riparian rights, Appropriation, Mexican Water Treaty, Submerged Lands Act, Desert Land Act, Federal Power Act, Boulder Canyon Project Act, Federal government, Water rights, State governments, Legal aspects.
Identifiers: *Constitutional law, Delegation of powers.

Federal encroachment on state water rights is discussed in relation to federal constitutional law. Rather than undertaking a detailed analysis of the cases, the author confines himself to the consequences that flow from the various legal theories upon which the federal government bases its power. These include the power to regulate interstate commerce, the war power, the property clause, the general welfare clause, and the treaty power. Focusing on state water rights in the West, the author reveals how these constitutional powers have been extended through federal legislation and court interpretation to place water resources under federal control. In relation to the possible unconstitutional delegation of power over federal water rights, seventeen instances of congressional legislation recognizing the supremacy of state laws are discussed. Rather than drawing any conclusions, the author points out the legal problems and claims of the contending forces and leaves the conclusions to the reader. An appendix, outlining provisions of federal statutes in recognition of state law as governing water rights, is included. (Schram-Florida)
W70-00549

FISHING AND RECREATIONAL RIGHTS IN IOWA STREAMS AND LAKES.

Iowa L Rev, Vol 53, No 6, p 1322-1346, June 1968. 25 p, 196 ref.

Descriptors: *Iowa, *Recreation demand, *Riparian rights, *Relative rights, Legal aspects, Navigable waters, Ownership of beds, Prescriptive rights, Recreation, Riparian waters, Riparian land, Water utilization, Non-consumptive use, Navigable rivers, Non-navigable waters, Streambeds, Meanders, Public lands, Public rights, State governments, Streams, Lakes, Usufructuary right, Fishing, Federal government.

This note examines the potential recognition of a public right of recreation in Iowa waters previously thought private. The nature of riparian rights and constitutional protections thereof in Iowa's riparian system are surveyed. Rationales for asserting state control over traditionally private waters are based on one of the following: navigability, non-susceptibility of water to private ownership and exclusive control, prior use or custom, and practical considerations of the usefulness of the water for the asserted activity. These bases are discussed separately. The federal and Iowa tests of navigability are compared. Also discussed are the following: (1) relationship of navigability to bed ownership; (2) severability of bed ownership from control over the water, (3) relation of navigability to public rights; (4) state concepts of navigability; (5) trust theories and impressing private beds with public trusts; (6) state ownership of waters; (7) self-help; (8) right of access to waters; (9) the reasonable use limitation on riparian rights; and (10) the distinction between lakes and streams. The best approach to the problem would seem to be the practical considerations doctrine which balances the interests of the parties. (Marsee-Florida)
W70-00550

FISHING AND RECREATIONAL RIGHTS IN IOWA STREAMS AND LAKES.
Iowa L Rev, Vol 53, No 6, p 1322-1325, June 1968. 25 p, 196 ref.

Descriptors: *Iowa, *Recreation demand, *Riparian rights, *Public rights, Relative rights, Legal aspects, Recreation, Riparian waters, Riparian lands, Water utilization, Non-consumptive use, State governments, Usufructuary right, Fishing, Federal government, Regulation.

This note examines the potential recognition of a public right of recreation in Iowa waters previously thought private. The precise extent of the riparian interest in water suitable for public recreation has not been determined in Iowa. Riparian rights constitute property interests and are protected under both the federal and Iowa constitutions. Abrogation of those rights must be justifiable as something other than an uncompensated taking of property. Three approaches might be taken to recognize a public right in waters deemed private. First, riparian rights are not absolute but are subject to limitation within the riparian system. A dominant right, such as a public right of navigation, may limit the riparian right. Second, riparian rights are subject to reasonable state regulation in the public interest. The major problem is separating valid regulation from an invalid taking of property. Third, since riparian rights are judicial creatures, in the absence of a clearly established public policy protecting such rights they may be altered or limited by adverse adjudication. (Marsee-Florida)
W70-00551

FISHING AND RECREATIONAL RIGHTS IN IOWA STREAMS AND LAKES.
Iowa L Rev, Vol 53, No 6, p 1326-1334, June 1968. 25 p, 196 ref.

Descriptors: *Iowa, *Recreation demand, *Riparian rights, *Navigable waters, Relative rights, Ownership of beds, Legal aspects, Prescriptive rights, Recreation, Riparian waters, Riparian lands, Water utilization, Non-consumptive use, Navigable rivers, Non-navigable waters, Streambeds, Meanders, Public rights, State governments, Governments, Streams, Lakes, Usufructuary right, Fishing, Federal government.

Rationales for asserting state control over traditionally private waters seem to be based on one of the following: navigability, non-susceptibility of water to private ownership, prior use or custom, or practical considerations of the water's usefulness. Since the federal test of navigability is one of fact while the Iowa test is one of whether the body of water was meandered in the original federal survey of public lands, the question of state or federal bed ownership in Iowa is not settled. Where the bed has passed to private riparian owner, a primary obstacle to the exercise of state control over the waters is encountered. However, it appears that ownership of the bed could be severed from ownership of the waters. Various states have developed a broader test of navigability for determining public rights of recreation than has Iowa. Such broad tests can be a good starting point toward providing more state control, however, such tests would not permit fishing or other recreational rights since at common-law such rights were distinct from navigation. As a corollary to navigation, however, the public has the expanded right to use the riparian owner's shoreline. (Marsee-Florida)
W70-00552

FISHING AND RECREATIONAL RIGHTS IN IOWA STREAMS AND LAKES.
Iowa L Rev, Vol 53, No 6, p 1334-1346, June 1968. 25 p, 196 ref.

Descriptors: *Iowa, *Recreation demand, *Riparian rights, *Relative rights, Legal aspects, Navigable waters, Prescriptive rights, Ownership of beds, Recreation, Riparian waters, Riparian land, Water utilization, Non-consumptive use, Navigable rivers, Non-navigable waters, Streambeds, Meanders, Public rights, State governments, Streams, Lakes, Usufructuary right, Fishing, Public benefits, Reasonable use, Taxes.

Various approaches exist for recognizing a public right of recreation and fishing in traditionally private waters: (1) private stream beds may be impressed with public trusts; (2) prior public use of waters overlying private beds may establish a prescriptive right; (3) custom on a state-wide basis may be sufficient to circumvent traditional riparian rights; and (4) waters within the state may be declared public. These approaches fail to meet the problems involved directly. An alternative involves considering the suitability of the water for public use and balancing public against private interests. One factor to be weighed is the reasonable use limitation on the riparian owner's right; it could be applied where the owner asserts an exclusive right of use against the public. Another factor is the distinction often made between streams and lakes for recreational purposes. Such distinction hinges on practical considerations and the determination that lakes may be suitable for a greater variety of recreational uses than streams. A recognized public right of recreation in waters would be of little use without the right of access. Special tax benefits could encourage riparian owners to open public access ways. (Marsee-Florida)
W70-00553

THE CHICAGO WATER DIVERSION CONTROVERSY,
For primary bibliographic entry see Field 04D.
W70-00554

RIPARIAN RIGHTS IN FLORIDA,
Richard H. Hunt.
U Fla L Rev, Vol 8, No 4, p 393-410, Winter 1955. 18 p, 65 ref.

Descriptors: *Riparian rights, *Florida, *Navigable waters, *Non-navigable waters, Natural use, Reasonable use, Civil law, Submerged Lands Act, Beaches, Ownership of beds, Bulkheads, Sandbars, Islands, Shallow water, Oceans, Legislation, History, Legal aspects, Riparian land, Riparian waters, Coastal structures, Landfills, High water mark.
Identifiers: *Common-law riparian rights, *Sovereignty, *Divestment.

Beginning with the cession of Florida to the United States in 1819, this article traces the development of riparian rights in Florida and discusses its present status. Since riparian rights on non-navigable and navigable waters differ, navigability is defined. The common law riparian rights are discussed using the language of the courts, and court interpretations of the law are given. Riparian acts of 1856 and 1921 are detailed and their effect on the law is shown through recent court opinions. The applicability of special laws to riparian rights is briefly discussed. Riparian rights in relation to Florida's beaches and the seas bounding the state are reviewed. In discussing nonnavigable waters, determination of ownership, use, and possibility of divestment are developed. The article endeavors primarily to outline the present state of the law in Florida by showing its development and, therefore, no conclusions are drawn. (Schram-Florida)
W70-00555

RIPARIAN RIGHTS IN FLORIDA,
Richard H. Hunt.
U Fla L Rev, Vol 8, No 4, p 393-397, Winter 1955. 5 p, 20 ref.

Descriptors: *Riparian rights, *Florida, *Navigable waters, *Non-navigable waters, History, Legislation, Ownership of beds, Legal aspects, Riparian lands, Riparian waters, Navigation, High water mark, Easements, Lakes, Streams, Usufructuary right, Relative rights.
Identifiers: *Common-law riparian rights.

Except for Spanish grants of submerged lands made prior to 1818, Florida applies an admixture of common law and statutory principles in determining the riparian rights of its inhabitants. Riparian rights differ between navigable and nonnavigable waters. Navigable waters in Florida include all lakes, rivers, bays, harbors, or other waters capable of practical navigation for useful purposes. Florida courts have held waters to be navigable even if the water is only suitable for floating rafts and logs or present only at certain seasons. A prime necessity, however, is that the water in its natural state be capable of sustaining navigation without any artificial aid or improvement. Two Florida cases have resolved the common-law rights incident to riparian owners. Riparian owners share with other residents of the state the right to use these waters for navigation. They may exercise the exclusive right of access to the waters from their riparian lands, but the waters and the lands thereunder belong to the state. Riparian rights are property rights and owners cannot be deprived of them without compensation. In addition, any special injury to an owner's use and enjoyment of his riparian land is compensable. (Schram-Florida)
W70-00556

RIPARIAN RIGHTS IN FLORIDA,
Richard H. Hunt.
U Fla L Rev, Vol 8, No 4, p 398-404, Winter 1955. 6 p, 20 ref.

Descriptors: *Florida, *Riparian rights, *Navigable waters, *Riparian land, Reasonable use, Legislation, Ownership of beds, Islands, Bulkheads, Shallow water, History, Landfills, Coastal structures, Riparian waters, Legal aspects, Sandbars, High water mark.

In 1856, the Florida Legislature enacted 'An Act to Benefit Commerce.' This act vested full title to riparian shallows in the riparian proprietors in order that they might fill in the shoreline and erect warehouses and wharves. Subsequent litigation has proved, however, that absolute title remains in the state and the act is a mere grant for a particular and specially defined use. This act was extended in 1921 to vest in riparian owners the title to submerged lands from the edge of the channel to the high water mark when this land is actually filled or permanently improved. Once this is done, absolute title vests in the riparian owner. Failure to bulkhead and fill, however, subjects the owner to divestment by the state. While it is yet undecided, it appears that an owner of a bay or river island cannot extend his land area by bulkheading and filling. This also applies to sandbars and shallow banks. Both private and public rights in certain bodies of water and lands riparian thereto are regulated by innumerable special acts, population acts, and local laws which are beyond the scope of this article. (Schram-Florida)
W70-00557

RIPARIAN RIGHTS IN FLORIDA,
Richard H. Hunt.
U Fla L Rev, Vol 8, No 4, p 404-410, Winter 1955. 7 p, 25 ref.

Descriptors: *Florida, *Riparian rights, *Navigable waters, *Non-navigable waters, Reasonable use, Civil law, Submerged Lands Act, Beaches, Ownership of beds, Bulkheads, Oceans, Legislation, History, Landfills, Legal aspects, Riparian lands, Riparian waters, Seashores, Relative rights.
Identifiers: *Sovereignty, *Divestment, Nuisance.

Recognizing the need of preserving its beaches for public use, the Florida Legislature has not extended to riparian owners on the ocean or Gulf of Mexico the right to bulkhead and fill lands below the high water mark. Any such intrusion by a riparian owner is unlawful and is treated as a nuisance. The Submerged Lands Act passed by Congress in 1953, established a distance of three miles from the coast line of each state as a general offshore limit of the state's right to submerged lands. An additional section, however, extends Florida's seaward boundaries to three geographical miles on the Atlantic Ocean and nine miles on the Gulf of Mexico. If any body of water in the state is nonnavigable in fact, the bed is subject to private ownership. Although undecided, it appears that Florida will follow the civil law reasonable use theory which allows adjacent riparian owners to use the whole body of water. The common law rule, however, only permits each owner to use the water above that portion of the bed owned by him. The question of private ownership of lands under water appears to be subject to possible divestment by holding the body of water to be navigable. (Schram-Florida)
W70-00558

THE NAVIGATION SERVITUDE AND JUST COMPENSATION--STRUGGLE FOR A DOCTRINE,
For primary bibliographic entry see Field 04A.
W70-00559

REAL PROPERTY--ALLUVION AND ACCRETION--ARTICLE 509 OF THE LOUISIANA CIVIL CODE,
Philip Claverie.
Tul L Rev, Vol 39, No 3, p 611-617, Apr 1965. 7 p, 28 ref.

Descriptors: *Louisiana, *Alluvium, *Accretion (Legal aspects), *Riparian rights, Bottom sediments, Channel morphology, Thalweg, Channels, Currents (Water), Streams, Running waters, Navigable rivers, Navigable waters, Beds, Riparian waters, Lakes, Judicial decisions, State jurisdiction, Riparian land, Rivers.

The articles of the Louisiana Civil Code that treat alluvion and accretion come directly from the French Code of 1804. The French law provided that riparian owners took title to accretions in rivers and other streams, but not in lakes and ponds. The Louisiana law omitted this section of the French law as well as a codified distinction between two kinds of lakes: public lakes or navigable lakes through which currents move and private lakes or land-locked lakes or ponds. The Louisiana courts have held that a riparian owner does not acquire ownership of accretion forming in lakes, bays, or arms of the sea regardless of their navigability. In the absence of a codified distinction between true lakes and other streams, however, the courts have proceeded case by case to decide whether the particular body of water in question is a river or stream, or a lake or pond. After examining the cases on point, the author concludes that the courts have failed to formulate a definitive test for determining ownership of alluvion formed in navigable waters and urges adoption of the French distinction based upon the presence of currents in the body of water. (Kelly-Florida)
W70-00560

REAL PROPERTY: DISPOSITION OF DIFFUSED SURFACE WATERS IN NORTH CAROLINA,
For primary bibliographic entry see Field 04A.
W70-00561

THE APPROPRIATION OF PROPERTY FOR LEVEES: A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
For primary bibliographic entry see Field 04A.
W70-00562

THE APPROPRIATION OF PROPERTY FOR LEVEES: A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
For primary bibliographic entry see Field 04A.
W70-00563

THE APPROPRIATION OF PROPERTY FOR LEVEES: A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
For primary bibliographic entry see Field 04A.
W70-00564

ESTUARINE LAND OF NORTH CAROLINA: LEGAL ASPECTS OF OWNERSHIP, USE, AND CONTROL,
David A. Rice.
NCL Rev, Vol 46, No 4, p 779-812, June 1968. 34 p, 169 ref.

Descriptors: *North Carolina, *Estuaries, *Tidal marshes, *Land tenure, Estuarine environment, Estuarine fisheries, Bays, Inlets (Waterways), Intertidal areas, Tides, Marshes, Wetlands, Coastal marshes, High water mark, Low water mark, Tidal effects, Navigation, Navigable streams, Riparian rights, Legal aspects, State jurisdiction.

Conservation and protection of estuarine lands in North Carolina are hampered by unresolved controversies over ownership and use of them. Historically tidelands have been held in trust for the public by the sovereign. The state has adopted this principle of British and colonial common law. If the covering water is unnavigable in fact, lands under tidewater may be conveyed to private owners. Confusion in developing a standard test of navigability, and inconsistencies in statutes permitting conveyance of marsh and swamplands have made difficult the classification of lands in regard to their susceptibility to private ownership. Other legal principles must also be considered in dealing with ownership of estuarine lands. Excluding domestic fisheries, ownership of fish and wildlife estuarine resources resides in the state. Another area of concern is ownership of land between high and low water marks. Cases have allowed conveyance where express intent is shown, but their present authority is questionable. The author further mentions statutory changes in the common law rules of accretion, reliction, avulsion, and erosion. The distinction is now between natural and artificial causes rather than between gradual and rapid land loss or gain. (Kelly-Florida)
W70-00565

COMPENSATION FOR THE RIGHT OF ACCESS TO NAVIGABLE WATERS,
For primary bibliographic entry see Field 04A.
W70-00566

THE RIGHT OF ACCESS TO NAVIGABLE WATERS--COMPENSABILITY UNDER EMINENT DOMAIN,
For primary bibliographic entry see Field 04A.
W70-00567

WATER--AS A SPECIES OF PRIVATE PROPERTY--THE ILLINOIS VIEW,
For primary bibliographic entry see Field 04A.
W70-00568

CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
For primary bibliographic entry see Field 04A.
W70-00569

WATER BOUNDARIES,
For primary bibliographic entry see Field 04A.
W70-00570

IRRIGATION IN KENTUCKY AS AFFECTED BY THE LAW OF RIPARIAN RIGHTS,
For primary bibliographic entry see Field 03F.
W70-00571

DETERMINATION OF RIGHTS TO REAL PROPERTY ALONG THE MISSOURI RIVER IN CONNECTION WITH RIVER STABILIZATION,
For primary bibliographic entry see Field 04A.
W70-00572

IOWA WATER LAW: PROBLEMS TO BE CONSIDERED.
Iowa L Rev, Vol 42, No 1, p 102-107, Fall 1956. 6 p, 31 ref.

Descriptors: *Iowa, *Usufructuary right, *Prior appropriation, *Beneficial use, Riparian rights, Condemnation, Natural flow doctrine, Artificial use, Competing uses, Irrigation water, Industrial water, Municipal water, Legal aspects, Legislation, Navigable waters, Ownership of beds, Underground streams, Percolating water, Natural use, Water supply.

Iowa currently suffers a lack of case law and statutes regarding the use of water for consumptive purposes. Beneficial use under the riparian system raises many prospective legal questions which must be resolved. Under this system, only the riparian owner is entitled to beneficial use. In addition, the riparian doctrine only concerns itself with surface and underground streams. Thus, percolating ground water, a valuable resource for irrigation and industry, presents a problem. The greatest difficulty involves competition for available water by industry, municipalities, and irrigation and the conflict between natural and artificial uses. Because condemnation appears impractical, a water law statute regulating beneficial use may be needed. Another possible solution to Iowa's water law problems is beneficial use under the prior appropriation system. Constitutional objections as well as the resulting static condition of water rights, however, make this system unsatisfactory for adoption in Iowa. The solution of legal problems involved in establishing control of water and priority of uses through legislation must, however, await the determination of: (1) the total amount of available water; (2) present beneficial uses; (3) possible future uses; and (4) costs of developing existing and future water supplies. (Schram-Florida)
W70-00573

LITTORAL RIGHTS ON THE GREAT LAKES,
John F. Power.
Notre Dame Lawyer, Vol 20, No 4, p 424-428, June 1945. 5 p, 22 ref.

Descriptors: *Great Lakes, *Littoral, *Riparian land, *Riparian rights, Michigan, Illinois, Indiana, Shores, Boundaries (Property), Lake beds, Lakes, Lake Michigan, Parks, Lake shores, Landfills, Easements, Piers, Docks, Meanders, Accretion (Legal aspects), Legal aspects, Low water mark, High water mark, Relative rights, Contracts.
Identifiers: *Right of adjacency, *Littoral rights.

Littoral is a more accurate term than riparian when referring to ownership on lake shores. Littoral rights necessarily include the right of adjacency although courts disagree as to whether littoral title will vest to the high or low water mark. Except for special purposes, the beds of the Great Lakes are not susceptible to private ownership but are held in public trust by the state. Although early Michigan cases indicated otherwise, both Michigan and Illinois now adhere to the doctrine that littoral rights extend to the waters edge and include rights of adjacency, accretion, and access. However, some exceptional cases have arisen in Chicago where the park system is composed chiefly of filled land and the shoreline is now some distance from its original location. Those cases involve the rights of owners who surrendered their littoral rights to such parks in consideration for the promise that the parks would beautify their property and that their view would remain unobstructed. To possess littoral rights in Indiana, the owner's land must border on the water. The littoral owner's right to fill is commonly governed by legislation today. (Marsee-Florida)
W70-00574

REAL PROPERTY--WATER RIGHTS--PUBLIC RIGHTS OF FISHING AND NAVIGATION OVER FLOODED LANDS.
For primary bibliographic entry see Field 04A.
W70-00575

THE LAW OF NAVIGABLE STREAMS IN WEST VIRGINIA,
Philip B. Hill.
W Va L Rev, Vol 59, No 1, p 73-78, Dec 1956. 6 p, 32 ref.

Descriptors: *West Virginia, *Mineralogy, *Ownership of beds, *Navigable rivers, Legal aspects, Administrative agencies, Beds, Permits, Boating, Tidal waters, Virginia, Judicial decisions, Legislation, Dredging, Leases, Remedies, Royalties, Public benefits, Mining, Regulation, Classification, Navigable waters, Easements.

The West Virginia Supreme Court of Appeals held in Campbell Brown and Co v Elkins, 93 SE2d 248 (W Va 1956), that the Public Land Corporation holds title to the beds of all navigable streams in the state and that said corporation may license individuals or corporations to extract minerals from the beds of navigable streams. The test of navigability turns on whether the stream can supply a useful commercial purpose to the public. The Campbell court noted that a stream need be navigable only for such times of the year as to make it valuable to the public. It is well settled in West Virginia that the beds of all navigable streams belong to the state. The Campbell case is interpreted as showing a judicial tendency of permissiveness towards allowing grants of beds with public retention of an easement therein. Present law in West Virginia prevents optimum utilization of mineral resources; this follows because mineral extraction is only permitted through state licensing, and because of state statutes licensees have no remedy when the state revokes their licenses. Statutory leasing provisions are recommended to promote utilization of mineral resources. (Keith-Florida)
W70-00576

THE MOVEMENT FOR NEW WATER RIGHTS LAWS IN THE TENNESSEE VALLEY STATES,
R. H. Marquis, R. M. Freeman, and M. S. Heath, Jr.
Tenn L Rev, Vol 23, No 7, p 797-837, Apr 1955. 41 p, 202 ref.

Descriptors: *Southeast US, *Tennessee River, *Water rights, *Riparian rights, Water utilization, Legislation, Legal aspects, Water law, Prior appropriation, Reasonable use, Natural flow doctrine, Surface waters, Natural streams, Underground streams, Percolating waters, Industrial water, Municipal water, Irrigation, Judicial decisions.
Identifiers: Constitutions.

An increased utilization of water and several years of abnormally low rainfall have stressed the need for a reexamination of the legal rules applicable to water rights in several southeastern states. Changes proposed would replace the existing riparian rights doctrine with the doctrine of prior appropriation. Since 1952, a number of proposals have been introduced into the legislatures and several study groups have been created. Major problems in the area involve supplemental irrigation and municipal and industrial water use. A number of assumptions have been made which underlie the argument in favor of prior appropriation. Many of these are essentially invalid. The author discusses the existing law in the Tennessee Valley states and the states using the prior appropriation doctrine as they apply to (1) surface waters in well-defined streams, (2) surface waters which spread in a diffused state, (3) underground waters in well-defined streams, and (4) underground percolating waters. The author also notes the constitutional questions raised by legislation which would destroy unused riparian rights without compensation. He argues that there are possible alternatives stressing the advantages of both legal doctrines. (Heckerling-Florida)
W70-00577

POLLUTION OF WATERS OF STATE.
For primary bibliographic entry see Field 05G.
W70-00578

POLLUTION OF WATERS OF THE STATE: THE STREAM POLLUTION CONTROL BOARD OF THE STATE OF INDIANA.
For primary bibliographic entry see Field 05G.
W70-00579

POLLUTION OF WATERS OF STATE.
For primary bibliographic entry see Field 05G.
W70-00580

POLLUTION OF WATERS OF STATE.

Ind Ann Stat secs 68-535 thru 68-543 (1961).

Descriptors: *Indiana, *Water pollution control, *Eminent domain, *Administrative agencies, Legislation, State governments, Water conservation, Standards, Pollution abatement, Interstate, Methodology, Decision making, Inter-agency cooperation, Regulation, Cost sharing, Condemnation, Grants, Waste disposal, Water quality control, Water quality.
Identifiers: *Water Pollution Control Act.

The Stream Pollution Control Board is the water pollution agency for this state and is authorized to represent the state in all matters relating to water pollution, to secure the benefits of the Federal Water Pollution Control Act, to develop interstate programs for the elimination or reduction of pollution, to approve municipal applications for loans or grants under the Act, and to participate through its authorized representatives in proceedings under the Act. The Board may condemn land when ordered to control, treat, and dispose of industrial and sanitary wastes. Provisions are made for a hearing in which a landowner may contest the necessity of a condemnation order. A landowner also retains his customary right to defend in proceedings in eminent domain. Condemnation of land is prohibited if there is a dwelling house located thereon at the time the act goes into effect. (Schram-Florida)
W70-00581

SWAN ISLAND CLUB V YARBROUGH (LANDS HELD IN TRUST FOR PUBLIC).

209 F2d 698-703 (4th Cir 1954).

Descriptors: *North Carolina, *Ownership of beds, *Navigable waters, Boundaries (Property), Public benefits, Recreation, Hunting, Navigation, Legislation, State governments, Public rights, Judicial decisions, Remedies, Legal aspects, Water law.
Identifiers: Torrens Land Act.

Plaintiff owned land lying between the Atlantic Ocean and a North Carolina sound. Some of this land was covered by navigable waters. He sought to enjoin alleged trespasses by defendants who maintained duck blinds within the area plaintiff claimed. The district judge decreed for defendants and plaintiff appealed. The court, agreeing with the district judge, held that the Torrens Land Act, upon which plaintiff's claims rested, did not have the effect of vesting title in plaintiff to lands covered by navigable waters. Navigable waters cannot be monopolized. Title to the land under such waters is held by the state in trust for the use of the public. A grant of such lands has never been adjudged to be within the legislative power. The purpose of a proceeding under the Torrens Land Act is to remove clouds from title, not to validate title to lands which under the laws of the state are not subject to private ownership. Even if title had vested in plaintiff, it would be subject to the same trust on behalf of the public as would be in effect if title were held by the state. (Gabrielson-Florida)
W70-00582

DEPARTMENT OF CONSERVATION.
For primary bibliographic entry see Field 04C.
W70-00583

DUTIES OF MINNESOTA LAND EXCHANGE COMMISSION.

Minn Stat Ann secs 94.341-94.52 (1964), as amended, (Supp 1969).

Descriptors: *Minnesota, *Land development, *Administrative agencies, *Forests, Forest management, Parks, Public land, Surveys, Wildlife conservation, Conservation, Land classification, Land appraisal, Land clearing, Land management, Land use, State governments, Federal government.
Identifiers: State forests.

The Minnesota Land Exchange Commission is responsible for the development of state forests and is authorized to: (1) acquire or lease lands for state forest and conservation purposes from the federal government or private citizens; (2) sell, lease, or exchange lands within its jurisdiction; (3) sue to quiet title to land within its authority; (4) make rules and regulations concerning the exchange of state lands; and (5) enter into agreement with federal officials toward the development of state lands. State land that may be exchanged is in three classes. The state retains certain mineral and water rights in exchanged lands. Title opinions by the Attorney General or the county attorney involved on land exchanged or to be exchanged must be submitted and approved by the Commission prior to a final exchange. The Reclamation Board has the duty to improve state swamp, stump, or cut-over lands for cultivation and sale. Municipalities and counties may grant land to the federal government for government purposes. (McDonough-Florida)
W70-00584

NETS AND SEINES, STURGEON, SHAD, AND HERRING SEASON.

Md Ann Code Art 66C secs 286 thru 292A, 294, 295 (1957).

Descriptors: *Maryland, *Fish conservation, *Nets, *Commercial fishing, Virginia, Tidal waters, Low water mark, Regulation, Headwaters, Downstream, Fishing, Equipment, Gill nets, Legislation, Fishing gear, Legal aspects, Seasonal.
Identifiers: *Non-tidal waters, *Fishing seasons.

The use of nets of certain lengths and types is regulated in designated areas of the Chesapeake Bay and the Patuxent River. Nets are prohibited in the Severn and Wicomico rivers, and their use limited to specified seasons in the Choptank and Mogothy rivers. Regulations concerning rod, hook, and line fishing in the Severn River are set forth. Fishing seasons for shad and herring are designated, and sale of fresh shad out of season is prohibited. The Department of Chesapeake Bay Affairs is authorized to regulate the taking of sturgeon in Maryland, and all seasons in Maryland are required to coincide with those in Virginia. (Harris-Florida)
W70-00585

OPERATION AND EQUIPMENT OF VESSELS.

Iowa Code Ann secs 106.1-106.8 (Supp 1969).

Descriptors: *Iowa, *Boating regulations, *Ships, *Accidents, Legislation, Legal aspects, Navigation, Damages, Administrative agencies, Conservation, Boating, State governments, Jurisdiction, Safety.
Identifiers: Motorboats.

It is the policy of this state to promote safety for persons and property in and connected with the use, operation, and equipment of vessels and to promote uniformity of laws relating thereto. The state conservation commission shall enforce these provisions. The operation of unnumbered motorboats is prohibited. Provisions are made for the registration and identifying by number of motorboats. Certain specified vessels are exempt from the provisions of this chapter. The operator of a vessel involved in a collision shall render such assistance as may be practicable and necessary. A report shall be filed with the commission giving any necessary information about the collision. All reports shall be confidential. When any request is made by an authorized official or agency of the United States, any information compiled or otherwise available to the commission under this act shall be transmitted to said official or agency. (Heckerling-Florida)
W70-00586

WATER NAVIGATION REGULATIONS.

Iowa Code Ann secs 106.18-106.34 (Supp 1969).

Descriptors: *Iowa, *Navigation, *Boating regulations, *Water sports, Legislation, Legal aspects, Boats, Inspection, Right-of-way, Artificial watercourses, Lakes, State governments, Structures, Buoys, Ice, Safety, Regulation, Administrative agencies.
Identifiers: Registration, Licenses.

The owner and operator of any undocumented vessel shall be liable for any injury or damage occasioned by the negligent operation of such vessel. One or more persons shall be appointed as boat inspectors and water safety patrolmen. All boats on any waters of this state must be inspected annually. Boat inspectors shall determine whether a boat is seaworthy. Any engineer or pilot on a vessel must have a license. Boat inspectors shall have the power to suspend or revoke the registration of any vessel for any of the herein enumerated reasons. Provisions are also made concerning overloading of vessels, rights-of-way rules, the removal of nonpermanent structures, and the drydocking of vessels failing to pass inspection. Certain types of watercraft are prohibited on artificial lakes. The use of buoys and driving on ice are regulated. Emergency vessels are given the right of way. (Heckerling-Florida)
W70-00587

FISH AND GAME.

Ark Stat Ann secs 47-501 thru 47-534 (1964).

Descriptors: *Arkansas, *Fish, *Wildlife, *Recreation, Legislation, Regulation, Fishing gear, Equipment, Nets, Boats, Water sports, Sport fishing, Fish management, Animal control, Commercial fishing, Dams, Streams, Lakes, Ponds, Legal aspects.
Identifiers: Penalties (Civil).

Miscellaneous provisions relating to hunting and fishing are provided. Game and fish are state property. Regulations concerning the unlawful possession of game, cold storage of game, non-resident permits to carry and ship game out of state, waste of game, firesetting, altering licenses, sale of confiscated fish and game together with penalties for violation thereof are set forth. Provisions for bringing game into the state, exporting and shipping game out of the state, sale of game fish raised in private waters, and applicable penalties are enumerated. Provisions regarding the control of dams or other obstructions, the screening of intake pipes used in the withdrawal of water from public watercourses, and the lowering of stage water are set forth. The duties of officers regarding enforcement of fish and game laws, and the duties of the prosecuting attorney, together with provisions for the disposition of fines and confiscation of fish and game, are included. The posting of lands, including commercial fish farms and manmade water storage reservoirs, is authorized. Hunting or fishing on such posted lands is unlawful. (Moulder-Florida)
W70-00588

BROWN V BOWLES (OFFSHORE FISHING RIGHTS).

254 A2d 696-700 (Md 1969).

Descriptors: *Maryland, *Fishing, *Interstate compacts, *Riparian rights, Rivers, Judicial decisions, Legislation, Land tenure, Islands, Remedies, Nets,

Virginia, Riparian land, Legal aspects, Interstate, Relative rights.
Identifiers: *Potomac River.

Plaintiff brought this suit to enjoin defendant from hauling a seine along the shore of an island located in the Potomac River and owned by plaintiff. On a number of occasions defendant had fished nearer than 100 yards from the shore of the island without permission and against the will of plaintiff. Plaintiff contended that the entry by defendant violated a state law which would give plaintiff first priority in seining in front of the property which he owned. The statute in question was enacted unilaterally by Maryland and never received the consent and approval of Virginia. The court discussed whether the statute abrogated a prior compact between Maryland and Virginia dating from 1785. If the 1785 Compact was still in effect, mutual consent of both states would be required for the statute to be effective. The court concluded that the Compact was still in effect and further that the statute plaintiff relied on was never intended to apply to that area of the Potomac within the jurisdictional boundary of the Compact. Since plaintiff's island was within the boundary of the Compact, judgment was for defendant. (Heckerling-Florida)
W70-00589

PROVISIONS AS TO DITCHES, DRAINAGE, AND RECLAMATION.
For primary bibliographic entry see Field 04A.
W70-00590

INDIANA BOARD OF PUBLIC HARBORS AND TERMINALS.

Ind Ann Stat sec 68-703 (1961).

Descriptors: *Indiana, *Harbors, *Port authorities, *Optimum development plans, Administrative agencies, Inter-agency cooperation, Programs, Feasibility studies, Cost sharing, Project planning, Grants, Eminent domain, Condemnation, Channel improvement, Navigation, Transportation, Construction, Structures.
Identifiers: Water terminals, Harbor construction.

The Indiana Board of Public Harbors and Terminals has been abolished. The powers given to this Board have been transferred to the Indiana Port Commission. The powers and duties enumerated in this act include the authority: (1) to carry on negotiations with the federal government for construction of public harbors and terminals in Indiana; (2) to purchase and sell land in connection with such public harbors and terminals; (3) to accept grants from any public or private agency, corporation, or individual for such site or to pay the expenses of the Board; (4) to purchase or accept grants of easements for widening of channels into such public harbors or terminals; (5) to construct a public harbor or terminal; (6) to condemn property to carry out the purposes and intent of this act; and (7) to prepare sketches, plans, and descriptive material for any such harbor or terminal, to compile data as to the necessity and advisability thereof, and to publish same and do any other act to promote any such harbor or terminal in the public interest. (Schram-Florida)
W70-00591

GREAT LAKES BASIN COMPACT.

Ind Ann Stat secs 68-901 thru 68-905 (1961).

Descriptors: *Indiana, *Great Lakes, *Interstate commissions, *Interstate compacts, Long-term planning, Natural resources, Conservation, Legislation, Lakes, Utilities, Harbors, Navigation, Fisheries, Stabilization, Water pollution control, Erosion control, Hydroelectric plants, Water utilization, Planning, Water conservation, Water levels, Flood control, Diversion, Water resources development, River basin development.

The Great Lakes Commission is hereby created. Each member state is entitled to three votes. The Commission shall have the power to: (a) collect, correlate, interpret, and report data relating to the water resources and the use thereof in the Great Lakes basin; (b) recommend methods for the development and conservation of the water resources; (c) consider the need for public works and improvements relating to water resources; (d) consider the means of improving navigation and port facilities; (e) consider the means of improving and maintaining fisheries; (f) recommend policies relating to water resources; (g) recommend laws relating to water resources; (h) prepare and publish reports and bulletins; (i) recommend agreements between the United States and Canada. Each party state agrees to consider the action the Committee recommends with respect to: stabilization of lake levels; pollution, erosion, and flood control measures; uniformity in navigation regulations, in fishing laws, and other water resource laws; suitable hydroelectric power developments; and diversion of waters from and into the basin. All the officers of this state are directed to help accomplish the purposes of this compact. (Smith-Florida)
W70-00592

FISH AND GAME.
Ind Ann Stat secs 11-1649 thru 11-1667 (1956), as amended, (Supp 1968).

Descriptors: *Indiana, *Fish, *Fish barriers, *Fish conservation, Legislation, Regulation, Frogs, Mussels, Streams, Dams, Minnows, Permits, Fish hatcheries, Fish management, Conservation, Fishing.
Identifiers: Penalties.

It is unlawful to set any obstruction other than a dam across a stream which prevents the free passage of fish. It is unlawful to use trot lines, set lines, or throw lines within fifty yards of any dam. It is unlawful to fish in a state-owned fish hatchery. Beaver Dam Lake is set aside for experimentation purposes and no person shall catch fish from the spawning ground therein or fail to report the catch, if taken outside the spawning ground, to the director of the Department of Conservation. A permit is required prior to taking more than five hundred live minnows. Hatchery-bred fish may be sold under regulations promulgated by the Department of Conservation. A license is required before engaging in the selling of minnows for bait. It is unlawful to export minnows from the state except for purposes of sale. Applicable penalties are provided. (Moulder-Florida)
W70-00593

DRAINAGE MAINTENANCE AND REPAIR DISTRICTS.
For primary bibliographic entry see Field 04A.
W70-00594

DRAINS: RIGHT-OF-WAYS--OBSTRUCTIONS--CROSSINGS--CONNECTIONS.
For primary bibliographic entry see Field 04A.
W70-00595

INDIANA DEEP WATERWAYS COMMISSION.
For primary bibliographic entry see Field 04A.
W70-00596

PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.

SC Code Ann secs 59-8, 59-14, 59-15 (1962).

Descriptors: *South Carolina, *Administrative agencies, *River basin development, *Water resources development, Navigation, Rivers, Reclamation, Floods, Flood control, Public health, Taxation, Electric power, Local governments, Hydroelectric power, Lakes.

The primary purpose for the creation of the Public Service Authority is the development of the Santee, Cooper, and Congaree rivers as instrumentalities of interstate, intrastate, and foreign commerce and navigation, reclamation of wastelands through flood control projects, and reforestation and improvement of public health in affected areas. Such aid and developoment is in all respects for the public benefit and is a public purpose. The Public Service Authority cannot be required to pay taxes on any activities or property acquired. Securities issued by the Authority are free from taxation. However, in determining the rate of sale for electric power, the taxes the Authority would have paid if privately owned, are properly to be considered. The Authority shall pay to various counties, municipalities, and school districts situated therein, a sum of money equivalent to the amount paid for taxes on properties at the time of their acquisition by the Authority. The Authority may construct the Santee-Cooper hydroelectric and navigation project as outlined by the Federal Power Commission. One lake constructed by the Authority and belonging to the state, located on the Cooper River near Pinopolis, shall hereafter be known as Lake Moultrie. The other lake so-owned and constructed in that area shall be known as Lake Marion. (Carruthers-Florida)
W70-00599

RIVER AND HARBOR IMPROVEMENTS.
For primary bibliographic entry see Field 04A.
W70-00696

DRAINAGE DISTRICTS UNDER 1911 ACT.
For primary bibliographic entry see Field 04A.
W70-00715

CONOBRE V FRITSCH (NATURAL WATERCOURSES).
For primary bibliographic entry see Field 04A.
W70-00720

APPEAL TO WATER RESOURCES BOARD.
W Va Code Ann, secs 20-5A-15 thru 20-5A-16 (1966), as amended, (Supp 1968).

Descriptors: *West Virginia, *Legislation, Permits, Judicial decisions, State governments, Legal aspects, Administrative agencies, Water resources, Waste treatment, Sewage disposal.
Identifiers: *Judicial review.

Any person adversely affected by an order made and entered by the Chief of the Division of Water Resources or aggrieved by his failure to act may appeal to the Water Resources Board. Notice of appeal will not stay the execution of the order unless the Board or the Director of the Department of Natural Resources finds its execution will result in unjust hardship for the plaintiff. For the purposes of conducting such appeal hearing, any member of the Board and the Secretary thereof may issue subpoenas and subpoenas duces tecum in the name of the Board. After hearing all of the testimony, evidence and record in the case, the Board can affirm, modify, or vacate the order of the Chief. In reading this decision the Board considers not only the factors the Chief was authorized to consider but also the economic feasibility of treating and/or controlling the sewage or waste involved. The Chief of the Division of Water Resources or any person adversely affected by a final order made and entered by the Board after such appeal hearing is entitled to judicial review thereof. (Gabrielson-Florida)
W70-00734

CASTAWAYS MOTEL V SCHUYLER (PERMISSION TO BUILD A BULKHEAD).

24 NY 2d 120, 299 NYS 2d 148-153 (1969).

Descriptors: *New York, *Bulkheads, *Beds, *Hydroelectric plants, Legal aspects, Judicial deci-

sions, Port authorities, Public lands, Ownership of beds, Patents, Docks, Obstruction to flow, Recreation, Conservation, Administrative agencies, Retaining walls, Regulation, Control, Administration, St. Lawrence River, Ice, Construction projects, Project purposes.
Identifiers: *Covenants, *Breakwalls, *Niagara River, Yacht clubs, Ice damages.

Plaintiff motel owner applied to defendant Commissioner of General Services for permission to construct a bulkhead in the Niagara River to protect the former's docks from ice damage caused by the Power Authority's Niagara project. Consent was given to begin construction while plaintiff's application was pending. On a determination that plaintiff's bulkhead would not interfere with the power project, defendant approved plaintiff's application, but this approval was contingent upon plaintiff's signing a release to the state and the power authority from any claims occasioned at any time. Plaintiff brought an action in Special Term to compel defendant to approve his application without the condition. Special Term dismissed the petition, Appellate Division affirmed, and plaintiff appealed. Aside from the procedural issues, the Court of Appeals held that applications under Section 75 of the Public Lands Law, dealing with grants of land under water, may be made to promote commerce, insure beneficial enjoyment by owners, or for agricultural purposes, for public park, beach, recreation, or conservation purposes. Since plaintiff's application was for his beneficial use and a determination had been made that plaintiff's bulkhead would not interfere with the power project, his application should have been unconditionally granted. (Keith-Florida)
W70-00735

ILLINOIS DRAINAGE CODE.

Ill Ann Stat ch 42, secs 3-1 thru 3-31 (Smith-Hurd 1956), as amended, (Supp 1969).

Descriptors: *Illinois, *Drainage, *Drainage districts, *Levees, Local governments, Agriculture, Environmental sanitation, Mining, Mine wastes, Engineering, Legislation, Outlets.

Drainage districts may be formed to engage in drainage or levee work for agricultural, sanitary, or mining purposes. Such districts may be organized upon a petition by landowners in the proposed district. After determining the validity of such petition the court shall appoint commissioners who shall examine the area proposed, employ an engineer to report to them, and file a report with the court. A hearing will be held after which the court will either dismiss the proposal or order the organization of the district. This order is final and is appealable. An alternative method of organization is the referendum submitted to the voters upon petition by interested landowners of the proposed district. Outlet drainage districts may be organized by either of the above procedures. Such districts are to aid two or more drainage districts by improving general outlets. Mutual drainage districts may be formed upon agreement of landowners requiring combined drainage facilities to protect their land. The procedure for organization will be the same as either of the above unless the agreement specifies otherwise. (Darragh-Florida)
W70-00737

WEST CENTRAL MISSISSIPPI WATERWAY COMMISSION.
Miss Code Ann secs 5956-301, 5956-306 (Supp 1968).

Descriptors: *Mississippi, *Channels, *Multiple-purpose projects, *Investigations, Legislation, Legal aspects, Public benefits, Navigation, Recreation facilities, Flood control, Irrigation, Water supply, Water resources development, Administrative agencies, Water utilization.

The West Central Mississippi Waterway Commission is created for the purpose of coordinating the effort necessary to develop and create a multipurpose waterway through several specified counties. The Commission is concerned with investigation, feasibility determination, development, and creation of the aforementioned multipurpose waterway. The duties of the Commission include the investigation of the possibility of creation and utilization of a domestic water supply, an industrial water supply, irrigation facilities, flood control facilities, power facilities, navigation facilities and recreation facilities as might be made available from the aforementioned waterway. (Keith-Florida)
W70-00738

STATE OWNERSHIP AND SALE OF SEA SHELLS.
Miss Code Ann secs 6048-01 thru 6048-03, 6048-08 (Supp 1968).

Descriptors: *Mississippi, *Shellfish, *Dredging, *Aquatic life, Legislation, Legal aspects, Oysters, Clams, Regulation, Mussels, Reefs, Beds, Banks, Jurisdiction, Contracts, Tidal waters, Administrative agencies, Commercial fishing, Conservation, Dredging, Financing, Control.
Identifiers: *Shells, *Marine biology, Seafood industry, Cay shells.

All shells of any shellfish within the territorial jurisdiction of the state are the property of the state. The Mississippi Marine Conservation Commission has authority over and control of all such shells. The Commission may contract for the sale of such shells to provide funds necessary for the operation of the Commission. Before the Commission grants any contract for the sale, dredging, and removal of shells, it must obtain a study by a marine biologist to determine whether such dredging can be done without harm to marine life; the Commission must also consult with the Gulf Coast Research Laboratory regarding these matters. The Commission closely regulates the removal of all shells. The Commission pays ten per cent from the proceeds of shell sales to the Gulf Coast Research Laboratory and may appropriate a sum not to exceed twenty-five hundred dollars per year to the Gulf States Marine Fisheries Commission. (Keith-Florida)
W70-00739

ILLINOIS PLANNING STUDIES AND COORDINATING ACTIVITIES,
Illinois State Board of Economic Development.
For primary bibliographic entry see Field 06B.
W70-00754

DRAINAGE DISTRICTS UNDER 1911 ACT: ORGANIZATION, POWERS AND EMPLOYEES OF COMMISSION; FEES, ETC.
For primary bibliographic entry see Field 04A.
W70-00759

THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05G.
W70-00766

A FRESH APPROACH TO WATER LAW,
For primary bibliographic entry see Field 06B.
W70-00768

LAWS OF FLORIDA GOVERNING WATER USE,
For primary bibliographic entry see Field 06D.
W70-00769

NORTH CAROLINA AND OTHER ATLANTIC STATES,
Claude L. Love.

Part of 'Water Law in the Eastern United States--A Symposium'. Am Water Works, Ass'n J, Vol 49, No 6, p 721-727, June 1957. 7 p, 10 ref.

Descriptors: *Natural flow doctrine, *Prior appropriation, *WATER ALLOCATION (Policy), *Water policy, Legislation, Water utilization, Beneficial use, Competing uses, Water rights, Riparian rights, Appropriation, Preferences (Water rights), Water conservation, Administrative agencies, Administration, Water law.

As local water supplies in the eastern United States continue to diminish and consumption increases, there is a growing need for legislation dealing with conservation and the equitable distribution of water. Generally, the eastern states with plentiful water supplies have been able to rely solely on the riparian doctrine to control water use. An examination of the legislation of the New England states and North Carolina reveals few statutes regulating the use of water. But, the riparian doctrine is a haphazard and fortuitous method of allocating water rights and as water supplies become limited it would seem wisest for state legislatures to learn from the experience of the drier western states and enact systems of water appropriation. Any legislation creating a system of appropriation should protect vested property rights, insure the greatest beneficial use of water resources, and conserve water resources. An administrative agency should be given the authority to determine rights to water use, to allocate water upon application, and to modify or cancel such allocations when circumstances and needs have changed. Bills have been introduced in the legislatures of several southern states which conform to these suggestions. (Gabrielson-Florida)
W70-00770

FEDERAL AIR AND WATER CONTROL: THE APPLICATION OF THE COMMERCE POWER TO ABATE INTERSTATE AND INTRASTATE POLLUTION,
For primary bibliographic entry see Field 05G.
W70-00771

SEDENTARY FISHERIES AND ARTICLE 2 (4) OF THE CONVENTION ON THE CONTINENTAL SHELF - A PLEA FOR A SEPARATE REGIME,
L. F. E. Goldie.
Am J Int L, Vol 63, No 1, p 86-97, Jan 1969. 12 p, 36 ref.

Descriptors: *Marine fisheries, *International law, *Continental Shelf, *Natural resources, Treaties, Prescriptive rights, Fish conservation, Fisheries, International waters, Law of the sea, Coasts, Marine geology, Fish management, Commercial fishing, Mussels, Oceans, Legal aspects, Legislation, Ownership of beds, Natural resources.
Identifiers: *Sedentary fisheries.

The sedentary fisheries provision of the 1958 Convention on the Continental Shelf defies determinability as to the exploitation of resources of the shelf and as to what species among natural resources of the shelf are to be covered by its terms. The provision was grafted onto a regime aimed at regulation and exploitation of mineral resources. It is feared that retention of the present article on sedentary fisheries will lead to enclosure movements by coastal states extending exclusive off-shore sedentary fishery rights. The author recommends the deletion of the present provision from the convention and suggests a variation of a 1951 International Law Commission proposed sedentary fisheries regime. This regime would require: (1) that sedentary fisheries be limited to specified species and areas wherein each fishery has been historically carried on; (2) that acquired rights of foreign fishermen based on historical practices should allow them to participate in the fisheries; and, (3) that these acquired rights be subordinated to the rights of the coastal state on the principle of abstention for economic management of the fisheries. All

regimes should be limited to specified depths on the shelf. Modifications could also be accomplished through treaty regimes. (McDonough-Florida)
W70-00772

UNITED STATES LEGISLATION RELATING TO THE CONTINENTAL SHELF,
Oliver L. Stone.
Int'l and Comp L Q, Vol 17, No 1, p 103-117, Jan 1968. 15 p, 57 ref.

Descriptors: *Continental shelf, *Submerged Lands Act, *Oceans, *Ownership of beds, Legislation, Federal government, Continental slope, Continental margin, Navigable waters, Beds, Tidal waters, Aquatic soils, Subsoil, Underwater, Beds under water, Oil, Natural gas, Mineralogy, Inlets (Waterways), Federal-state water rights conflicts, Federal jurisdiction, State jurisdiction, Leases, Exploitation, Drilling, Core drilling, Exploration, Law of the sea, Continental shelf.
Identifiers: Inland waters.

The Submerged Lands Act vests in the coastal states ownership of lands beneath navigable waters, including submerged lands lying within three nautical miles of the coast line. The seaward limit of inland waters remains unsettled, but the dispute over federal-state ownership of the inner continental shelf has been resolved in favor of the states. Following a proclamation by President Truman in 1945, which asserted jurisdiction and control over the continental shelf, the Outer Continental Shelf Lands Act extends exclusive jurisdiction and control of the subsoil and seabed out to whatever limit the United States is legally capable of reaching. The Secretary of the Interior is authorized to lease gas, oil, and other mineral rights to private industry. The Act applies the whole body of federal law to the subsoil and seabed of the outer continental shelf plus laws of adjacent states that are not inconsistent. The seaward limits of the Act are flexible, subject to particularizing by the courts according to contemporary concepts and not limited by the often used 100 fathom figure. It has been assumed that the Secretary's leasing authority is co-extensive with the assertion of valid jurisdiction over the continental shelf. (Douberley-Florida)
W70-00773

CURRENT DEVELOPMENTS IN GROUND WATER LAW.
For primary bibliographic entry see Field 04B.
W70-00774

RIGHTS OF WAY FOR DRAINAGE.
For primary bibliographic entry see Field 04A.
W70-00775

CURRENT LEGISLATION,
Herbert J. Slaughter.
Fed B J, Vol 6, No 3, p 316-324, Apr 1945. 9 p, 25 ref.

Descriptors: *Legislation, *Tennessee Valley Authority Project, *Federal project policy, *Project purposes, Federal government, Management, Regions, Water resources development, Project planning, Multiple-purpose projects, Columbia River Basin, Administration, Governments, Interagency cooperation, Interstate, Political aspects, Planning, Long-term planning, River basin development, Administrative agencies.

A comparison is made between Congressional bills which have organizational forms patterned after the Tennessee Valley Authority. The Murray bill for the Missouri Valley Authority seeks to centralize the control of all regional programs in a single multi-purpose agency, managed by three directors. The bill envisions a single comprehensive plan for development of the valley and execution of the plan by a single federal agency. The Mitchell bill for the Columbia Valley Authority seeks to integrate the Authority into the general government organizational pattern. A national board supervised by the Secretary of the Interior would review all plans and coordinate them with other agencies. The Interior Department bill seeks to gear agencies more closely to the people concerned in accordance with regional and national plans of natural resources development. Secretary of the Interior supervision and close financial control assures an orderly development of national resources through existing agencies. The Rankin bill proposes nine authorities to cover the entire nation, each controlled by a separate administrator and coordinated by the President. The author cautions against programs that ignore existing agencies and working arrangements. (Douberley-Florida)
W70-00776

THE WANDERING MISSOURI RIVER: A STUDY IN ACCRETION LAW,
Robert E. Beck.
N D L Rev, Vol 43, No 1, p 429-466, Fall 1966. 38 p, 163 ref.

Descriptors: *Accretion (Legal aspects), *Missouri River, *Avulsion, *Riparian rights, Riparian land, Boundaries (Property), Rivers, Levees, Dams, Flood protection, Iowa, North Dakota, South Dakota, Kansas, Missouri, Nebraska, Montana, Judicial decisions, Water law, Legal aspects, River flow.

The Missouri River, a stream whose course has long been characterized by rapid changes and alterations, provides the background for a study of accretion law. A discussion of the historical rationales behind the basic accretion doctrine is presented. The author notes that the seven states bordering the Missouri River all apply the accretion doctrine to the stream in spite of its vagrant nature. However, because of the river's frequent wandering, it is particularly difficult to distinguish accretion from avulsion. The characteristics of avulsion and the evidentiary problems in proving it are discussed. A review is presented of case decisions in the states bordering the Missouri River concerning the ownership of riparian land which has been completely submerged but at a later date is bared and readily identifiable. It is suggested that these states re-introduce a consideration of the time element in deciding cases of this nature. Such a consideration would allow the courts flexibility which does not presently exist. (Gabrielson-Florida)
W70-00777

THE WANDERING MISSOURI RIVER: A STUDY IN ACCRETION LAW,
Robert E. Beck.
N D L Rev, Vol 43, No 1, p 429-439, Fall 1966.

Descriptors: *Accretion (Legal aspects), *Missouri River, *Avulsion, *Riparian rights, Riparian land, Boundaries (Property), Alluvium, Erosion, River flow, Legal aspects, Iowa, North Dakota, South Dakota, Kansas, Missouri, Nebraska, Montana, Judicial decisions, Water law, Access routes.
Identifiers: Dereliction, Reliction.

The wandering nature of the Missouri River has placed a heavy burden on the law of accretion, especially where formerly inundated land is again bared. This situation is the focal point of this article. Accretion, dereliction, erosion, avulsion, and alluvion are distinguished and defined. Generally alluvion formed by accretion or reliction belongs to the owner of the adjacent land, irrespective of who owned the bed at the time. However, when avulsion occurs, ownership does not change. Six rationales exist for shifting boundaries when accretion and reliction are involved: (1) new land, by accession, ought to belong to the land to which it was added; (2) the river is a natural boundary and when the river moves, the boundary moves; (3) since accretion is gradual and imperceptible, it is a trifle with which the court will not concern itself; (4) the adjacent owner is in the best position to make productive use of the land; (5) since the riparian owner is subject to the risk of loss by action of the water, he ought to benefit from a gain; and (6) the right of access to the water must be preserved. (Marsee-Florida)
W70-00778

THE WANDERING MISSOURI RIVER: A STUDY IN ACCRETION LAW,
Robert E. Beck.
N D L Rev, Vol 43, No 1, p 439-451, Fall 1966.

Descriptors: *Accretion (Legal aspects), *Missouri River, *Avulsion, *Riparian rights, Riparian land, Boundaries (Property), Rivers, Levees, Dams, Iowa, North Dakota, South Dakota, Kansas, Missouri, Nebraska, Montana, Judicial decisions, Water law, Legal aspects, River flow, Alluvium, Erosion, Riprap, Relative rights.
Identifiers: Reliction.

Since the doctrine of accretion requires gradual and imperceptible change, an important question is whether the law of accretion applies to the quick-changing Missouri River at all. Generally, courts have applied the law of accretion to the Missouri. Another problem is distinguishing between accretion, reliction, and erosion on one hand and avulsion on the other. The article looks in detail at the differences between erosion and avulsion. In determining whether avulsion, accretion, reliction, or erosion has taken place, at least four categories concerning evidence or proof can be established: (1) eye-witness testimony as to the rapidity of the action; (2) soil composition and other geological data; (3) size and kind of vegetation; and (4) presumptions. Several courts have accepted a rebuttable presumption in favor of accretion. The question of how man-made activity on the River affects the doctrine of accretion should also be considered, especially in light of recent stabilization work. Generally, Missouri River courts have deemed irrelevant the fact that alluvion has formed because of artificial barriers such as dams, levees, or dikes unless the riparian owner involved has been primarily responsible for its creation. (Marsee-Florida)
W70-00779

THE WANDERING MISSOURI RIVER: A STUDY IN ACCRETION LAW,
Robert E. Beck.
N D L Rev, Vol 43, No 1, p 451-466, Fall 1966. 38 p, 163 ref.

Descriptors: *Accretion, *Missouri River, *Avulsion, *Riparian rights, Riparian land, Boundaries (Property), Rivers, Levees, Dams, Iowa, North Dakota, South Dakota, Kansas, Missouri, Nebraska, Montana, Judicial decisions, Water law, Legal aspects, River flow, Alluvium, Erosion, Relative rights, Legialation, State governments, Regulation, Control.

In applying the accretion doctrine to such rapid changes as occur on the Missouri River, two questions seem of primary importance. How important are the theories underlying the accretion doctrine today. Who are competing for a particular tract of land, private parties or a private party versus the state. A review is presented of case decisions in the states bordering the Missouri River concerning the ownership of riparian land formerly inundated but later bared and readily identifiable. It is concluded that: (1) these states should re-introduce a consideration of the time element in deciding cases of this nature; (2) all seven Missouri River states have accepted the doctrine of accretion notwithstanding the quick-changing nature of the Missouri; (3) the accretion doctrine should be applied when the contest involves a private party versus the state, and the presumption should be in favor of accretion as contrasted with avulsion; (4) legislation should not be necessary to import the time element consideration into the determination of disputes, but this may be the best route; and (5) the time element consideration should apply to

both government and private boundary lines. (Marsee-Florida)
W70-00780

COMPENSATION FOR TAKING OF FLOWAGE EASEMENTS BY CONDEMNATION,
For primary bibliographic entry see Field 04A.
W70-00781

TIDELANDS IN SOUTH CAROLINA: A STUDY IN THE LAW OF REAL PROPERTY,
W. Turner Logan, and Ruth Williams.
S C L Rev, Vol 15, No 3, p 657-676, 1963. 20 p, 49 ref.

Descriptors: *South Carolina, *Public lands, *Land tenure, *Tidal marshes, High water mark, Low water mark, Tidal waters, Navigable waters, Estuaries, Legal aspects, Boundaries (Property), Ownership of beds, Marshes, Wetlands, Land reclamation, Judicial decisions, Riparian rights, Navigable rivers, Reclamation.
Identifiers: Adverse possession.

It is commonly stated that land between the high and low water marks of tidal navigable streams (hereinafter referred to as marshland) belongs to the public, and that the state holds it in trust. The author questions the applicability of this theory in South Carolina. Older decisions indicate that marshlands are grantable, and only dictum in one often-cited case contradicts this. More recent holdings have permitted private ownership of marshlands. Case law in South Carolina suggests that adverse possession may operate against the state. If marshland is susceptible to private ownership, a 'presumption of grant' from the state should apply to marshland to the same extent as it does to other grantable state lands. The value of marshland in terms of reclamation and in regard to agricultural potential, to hunting, and to mineral deposits, demands that a new and critical analysis of its legal status and susceptibility to private ownership be made. (Kelly-Florida)
W70-00782

THE UNITED NATIONS AND MARINE RESOURCES,
For primary bibliographic entry see Field 06B.
W70-00783

PUBLIC RIGHT AND THE RULE OF NO COMPENSATION,
For primary bibliographic entry see Field 04A.
W70-00785

OIL POLLUTION OF THE SEA.
For primary bibliographic entry see Field 05G.
W70-00786

OIL POLLUTION AND THE SEA: THE SOURCES OF POLLUTION.
For primary bibliographic entry see Field 05B.
W70-00787

COMMISSIONERS OF HEALTH AND DRAINAGE IN CERTAIN COUNTIES.
For primary bibliographic entry see Field 04A.
W70-00788

OIL POLLUTION OF THE SEA: THE EFFECTS OF POLLUTION.
For primary bibliographic entry see Field 05C.
W70-00789

OIL POLLUTION OF THE SEA: THE INTERNATIONAL RESPONSE.
For primary bibliographic entry see Field 05G.
W70-00790

OIL POLLUTION OF THE SEA: THE INTERGOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION.
For primary bibliographic entry see Field 05G
W70-00791

OIL POLLUTION OF THE SEA: UNITED STATES ACTION.
For primary bibliographic entry see Field 05G.
W70-00792

OIL POLLUTION OF THE SEA: PRIVATE REMEDIES.
For primary bibliographic entry see Field 05G.
W70-00793

OIL POLLUTION OF THE SEA: THE EFFORTS OF THE OIL AND SHIPPING INDUSTRIES.
For primary bibliographic entry see Field 05G.
W70-00794

OIL POLLUTION OF THE SEA: DETECTION.
For primary bibliographic entry see Field 05A.
W70-00795

OIL POLLUTION OF THE SEA: CLEANING UP.
For primary bibliographic entry see Field 05D.
W70-00796

RIPARIAN RIGHTS IN ARTIFICIAL LAKES AND STREAMS,
For primary bibliographic entry see Field 04A.
W70-00797

NAVIGABLE WATERS--RIGHT OF RIPARIAN OWNER TO ARTIFICIAL ACCRETION,
For primary bibliographic entry see Field 04A.
W70-00798

COMMON LAW RIGHTS TO SURFACE WATERS,
For primary bibliographic entry see Field 04A.
W70-00799

STATUTES-EXTENT OF THE AUTHORITY OF THE DEPARTMENT OF CONSERVATION.
For primary bibliographic entry see Field 04A.
W70-00800

CONSTITUTIONAL LAW-NAVIGABLE WATERS-EXTENSION OF THE FEDERAL PREROGATIVE,
For primary bibliographic entry see Field 04A.
W70-00801

WATERS AND WATERCOURSES - EASEMENTS - IMPLIED DEDICATION OF FLOWAGE EASEMENT APPURTENANT TO A DAM,
For primary bibliographic entry see Field 04A.
W70-00802

RIPARIAN RIGHTS - RIGHT TO FOLLOW ACCRETIONS ACROSS FIXED BOUNDARY LINE.
For primary bibliographic entry see Field 04A.
W70-00803

EQUAL FOOTING AND THE MARGINAL SEA,
For primary bibliographic entry see Field 04A.
W70-00804

FRONTIER TOWN PROPERTIES, INC V STATE (CONDEMNATION VALUE OF WATER USE).
For primary bibliographic entry see Field 06C.
W70-00805

WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 05G.
W70-00806

HUNTING AND FISHING LICENSES.

W Va Code Ann, secs 20-2-42, 20-2-43, 20-2-44b, 20-2-48, 20-2-53, 20-2-56 (1966).

Descriptors: *West Virginia, *Permits, *Fishing, *Classification, Legislation, Legal aspects, Ohio River, Hunting, Streams, Regulation, National forests, Wildlife management, Frogs, Turtles, Aquatic life, Ponds, Riparian rights, Impoundments, Administrative agencies, Natural resources, Fish reproduction, Federal government, Wildlife conservation, Commercial fishing.
Identifiers: *State parks.

Fishing licenses are required for residents and nonresidents, and special licenses are required to fish in state parks. The state department of natural resources will cooperate with the United States forest service to improve wildlife resources. Licenses may be issued for the operation of private ponds or businesses for the propagation, sale, or purchase of forms of aquatic life for commercial purposes; the activities of such licensees is regulated by the director to insure against violation of riparian rights of others and detrimental effects on natural resources. Licenses may be similarly issued for the operation of commercial fishing ponds. (Keith-Florida)
W70-00807

CERTAIN FERRIES OPERATED BY CONNECTICUT.

Conn Gen Stat Ann sec 13a-252 (1958).

Descriptors: *Connecticut, *Ships, Administration, Transportation, Income, Costs, Administrative agencies, Operation and maintenance, Operating costs, State governments.
Identifiers: *Ferries.

Two state-run ferries crossing the Connecticut River are maintained and operated by the highway commissioner. He, with the approval of the Commissioner of Finance and Control, determines the tolls to be charged and deposits the receipts with the state Treasurer. Operating expenses are paid by the Controller on vouchers of the Highway Commissioner. The Commissioner must also make a report to the general assembly on the receipts and expenses incidental to the operation of the ferries. (Gabrielson-Florida)
W70-00808

COMMISSIONERS OF STEAMSHIP TERMINALS.

Conn Gen Stat Ann secs 15-27 thru 15-31 (1958), as amended, (Supp 1968).

Descriptors: *Connecticut, *Transportation, *Bridge construction, *Navigable waters, Legislation, Legal aspects, Administrative agencies, Cities, Construction, Maintenance, Docks, Piers, Dikes, Canals, Jurisdiction, Maps, Surveys, Rivers, Harbors, Banks, Erosion, Easement, Riparian rights, Permits, Structures, Costs, Watersheds (Basins), Civil engineering, Ships, Financing, Transportation control, Federal government, Regulation, Control.
Identifiers: *Steamship terminals, *Harbor improvement, Harbor facilities, Obstructions to navigation, Penalties (Criminal).

Provision is made for the method of appointment of commissioners of steamship terminals; their length of service and the professions from which they may be chosen are stipulated. The commissioners may acquire, construct, maintain and operate such docks, wharves, piers, quays, dikes, canals, slips, basins, terminals, or other appropriate harbor facilities, and water transportation facilities in specified cities as are required to promote the in-

terchange of rail and water traffic. The commissioners consult and cooperate with the federal authorities regarding any river or harbor improvement or the construction of any bridge over navigable waters within the state. The commissioners may cause surveys to be made of navigable waters or extensions thereof, of waters that may be made navigable, or for the protection of river banks against erosion. The commissioners confer with cities concerning water terminal facilities and promote greater coordination between water and rail transportation. The commissioners are charged with conservation and development of water transportation. The commissioners may sell such lands, easements, riparian rights, and other property as may be acquired by them; the disposition of proceeds from such sales and from operations is provided for. Persons obstructing navigation in specified ways are subject to criminal penalties. (Keith-Florida)
W70-00809

POTOMAC RIVER COMPACT OF 1958.

Md Ann Code Art 66C sec 261 A (1957).

Descriptors: *Maryland, *Interstate compacts, *Fish management, *Fisheries, Virginia, Legislation, Regulation, Ownership of beds, Low water mark, Riparian rights, Oysters, Clams, Shellfish, Crabs, Fish conservation, Water resources development, Permits, Docks, Administrative agencies.
Identifiers: Penalties, Finfish.

The Potomac River Compact of 1958 between Virginia and Maryland is agreed to by the commissioners appointed by the respective states. The Potomac River Fisheries Commission is established. Regulations for compensation, meetings, offices, and employees are set forth. The Commission's jurisdictional boundaries are delineated. The Commission has the power to survey oyster bars within its jurisdiction. It may reseed and replant said bars. The size, type, and description of all species of finfish, crabs, oysters, clams, and other shellfish which may be taken are conservation and repletion of fishery resources. Licenses may be issued for fishing and for equipment to be used within the Commission's territory. Other Commission powers and duties regarding expenditures, regulations, inspection tax, and the dredging of soft-shell clams are set forth. Regulations for procedure and review of Commission regulations are set forth. Penalties are provided for violations of these regulations. Rights of citizens of Virginia and Maryland to erect and maintain wharves and other improvements are not altered or diminished. Laws of Maryland relating to finfish, crabs, oysters, and clams in the Potomac River remain applicable except when changed by Commission regulation. (Moulder-Florida)
W70-00810

NATURAL RESOURCES (OYSTERS AND CLAMS).

Md Ann Code Art 66C secs 696, 698 thru 704, 707, 708, 709, 710, 712 thru 717 (1957), as amended, (Supp 1968).

Descriptors: *Maryland, *Clams, *Oysters, *Commercial shellfish, Legislation, Regulation, Administration, Mollusks, Dredging, Fishing, Permits, Industries, Commercial fishing, Fishing gear, Conservation, Public benefits, Management, Hydraulic equipment, State jurisdiction, Legal aspects.
Identifiers: Penalties.

Regulations pertaining to the taking of oysters and clams are set forth. Basic definitions, geographical areas and other general provisions applicable to the industry are included. Provisions covering the culling of oysters, tonging, licensing fees and requirements, restricted areas, and certain exceptions are set forth. Dredging restrictions, including land area, boat and dredge size, and licensing requirements together with special provisions for dredging in county waters are provided. The Potomac River fisheries are reserved for residents of Virginia and Maryland. Oyster packers and dealers are regulated in line with legislative provisions for propagation of oyster culture, including private oyster culture. Areas to be leased, who may lease, procedures for obtaining a lease, the type of oyster that may be harvested and fees are provided. Taxing and licensing provisions relating to the oyster and clam industry are provided. Soft-shell clam regulations are promulgated for specific counties. (Moulder-Florida)
W70-00811

SHOREFRONT PARK IMPROVEMENT ASSOCIATION, INC V KING (RIPARIAN RIGHTS AND RESTRICTIONS ON THE RIPARIAN LAND).

253 A2d 29-34 (Conn 1968).

Descriptors: *Connecticut, *Riparian rights, *High water mark, *Low water mark, Legal aspects, Judicial decisions, Marinas, Navigable waters, Water law, Boundaries (Property), Piers, Leases, Docks, Riparian land, Ownership of beds, Competing uses, Recreation, Relative rights, Riparian waters.
Identifiers: *Restrictive covenants, *Subdivisions, *Intent, Yacht clubs, Reciprocal rights, Moorings, Injunctions (Prohibitory).

Plaintiffs are homeowners in a subdivision in which lots are sold with restrictive covenants in the deeds; the restrictive covenants are of a type commonly used to keep an area residential in nature. Defendant corporation leased several lots within the subdivision for use as a yacht club and marina. The Superior Court granted plaintiff's plea for injunctive relief and the defendant appealed. The Supreme Court first found that the proposed use of lots within the subdivision for business purposes would be in direct violation of the covenants. The Supreme Court then noted that the title to land between high and low water marks is in the state; this being the case, such rights as the defendant has to build docks and piers below the high water mark are riparian rights which have their source in the property ownership of the land above the high water mark. It follows that defendant's riparian rights are subject to the restrictive covenants; the decision of the Superior Court was affirmed. (Keith-Florida)
W70-00812

PIERCE V RILEY (UNREASONABLE EXTENSION OF RIPARIAN RIGHTS).

168 NW2d 309-311 (Ct App Mich 1969).

Descriptors: *Michigan, *Riparian rights, *Easements, Right-of-way, Riparian land, Access routes, Lakes, Lake shores, Non-consumptive use, Recreation, Water rights, Legal aspects, Judicial decisions, Remedies, Water utilization.
Identifiers: Injunctions (Prohibitory).

Plaintiffs, riparian property owners, filed suit for a declaration of rights and to enjoin defendant real estate developers from granting easements of right-of-way to non-riparian lot owners. Defendants owned 91 lots, one of which fronted on the lake. Defendants proposed to sell the lots and provide all lot owners with access to the lake by granting easements of right-of-way across their lake front lot. Plaintiffs contended that this would constitute an extension of use and riparian rights that would result in an unreasonable burden on other riparian owners. After a hearing, the trial court found in favor of defendants, and plaintiffs appealed. The appellate court found that an injunction was a proper method through which plaintiffs could seek to protect their property rights. The court remanded the case for reconsideration of the reasonableness of the use in light of the factors set forth in Thompson v Enz, 154, NW2d 473, with both parties being given the right to present additional evidence as to the reasonableness of the factors not pleaded. (Gabrielson-Florida)
W70-00813

CANALS AND WATERWAYS.
For primary bibliographic entry see Field 04A.
W70-00814

ILLINOIS DRAINAGE LAW (A COMMENTARY).
Illinois State Bar Association.
For primary bibliographic entry see Field 04A.
W70-00815

PUBLIC UTILITIES (PUBLIC WATER DISTRICTS).

Ill Ann Stat ch 111 2/3, secs 188-212.10 (Smith-Hurd 1966), as amended, (Supp 1969).

Descriptors: *Illinois, *Water districts, *Water works, *Public benefits, Legislation, Administration, Regulation, Utilities, Water distribution (Applied), Water rates, Water supply, Public health, Public utility districts, Sewage treatment, Sanitary engineering, Rates, Financing, Capital, Operation and maintenance, Condemnation, Administrative agencies.

The creation of public water districts by election is authorized. Such water districts are managed by a board of seven trustees which act as the corporate authority of the district. Attorneys and engineers may be appointed. Land condemnation proceedings are authorized. The districts are authorized to construct, maintain, and extend water mains where necessary. The districts may contract to supply water outside the district. The boards of trustees may maintain, operate, and improve water works properties within districts in which the boards consider such action conducive to public health. The boards establish rates and charges. Revenue bonds may be issued. The districts may construct water works within villages or towns not owning or operating water works systems. The districts have the power to acquire, maintain, and operate sewerage properties and may issue revenue bonds for this purpose. Contiguous territory may be annexed by the water districts. Procedures are outlined for the annexation and dissolution of districts. (Moulder-Florida)
W70-00816

ISLANDS AND ABANDONED RIVER CHANNELS.
For primary bibliographic entry see Field 04A.
W70-00817

LEVEES.
For primary bibliographic entry see Field 04A.
W70-00818

LEVEES.
For primary bibliographic entry see Field 04A.
W70-00819

LEVEES.
Ky Rev Stat Ann secs 266.120-266.990 (1963).

Descriptors: *Levees, *Kentucky, *Construction, *Administrative agencies, Legislation, Eminent domain, Engineering structures, Local governments, Adjudication procedure, Administrative decisions, Easements, Equitable apportionment, Judicial decisions, Compensation, Construction costs, Assessments loans, Taxes, Maintenance costs, Decision making, Operation and maintenance.

The board of levee commissioners shall superintend the construction, care, and protection of the levee. They may enter upon, acquire, take and hold

any lands necessary and proper for locating, constructing, enlarging, and maintaining the levee. In order to carry out their duties, the board may: (1) enter into agreements with any commission or agency of the federal government; (2) levy and collect an annual tax on property within the territory protected by the levee; (3) borrow needed funds and issue, negotiate and sell bonds for this purpose; and (4) make additional assessments under drainage law procedure to meet needed expenses. A lien for the costs of the levee shall exist against all land within the territory protected by the levee. When it will be conducive to the public welfare or benefit, any county court may establish and aid in the construction of any levee within the county. Provisions for fining violators of the provisions of this chapter are outlined. (Schram-Florida)
W70-00820

DRAINAGE AND RECLAMATION ACT OF 1912.
For primary bibliographic entry see Field 04A.
W70-00821

DRAINAGE AND RECLAMATION ACT OF 1912.
For primary bibliographic entry see Field 04A.
W70-00822

DRAINAGE AND RECLAMATION ACT OF 1912.
For primary bibliographic entry see Field 04A.
W70-00823

DRAINAGE AND RECLAMATION ACT OF 1912.
For primary bibliographic entry see Field 04A.
W70-00824

DRAINAGE AND RECLAMATION ACT OF 1912.
For primary bibliographic entry see Field 04A.
W70-00825

OHIO RIVER VALLEY WATER SANITATION COMPACT.
For primary bibliographic entry see Field 05G.
W70-00826

FLOOD CONTROL ACT.
For primary bibliographic entry see Field 04A.
W70-00827

FLOOD CONTROL ACT.
For primary bibliographic entry see Field 04A.
W70-00828

FLOOD CONTROL ACT.
For primary bibliographic entry see Field 04A.
W70-00829

INTERSTATE DRAINS.
For primary bibliographic entry see Field 04A.
W70-00830

FISH NOT TO BE KILLED OR TAKEN BY EXPLOSIVES.
Miss Code Ann sec 2158 (1956).

Descriptors: *Mississippi, *Fish, *Fish conservation, *Explosives, Legislation, Standards, Fish management, Fishing, Wildlife conservation, Wildlife management, Legal aspects, Regulation.
Identifiers: *Dynamite fishing, Fishing with explosives, Penalties (Criminal).

Any person who catches or destroys fish by the use of dynamite, gunpowder, or other explosive substance shall, on conviction, be fined not less than one hundred dollars and/or be imprisoned in the county jail not exceeding three months. (Schram-Florida)
W70-00831

DRAINAGE OF WATER FROM PUBLIC ROADS; AND REPAIR OF FLOOD DAMAGE TO CERTAIN ROADS.

Miss Code Ann sec 8317, 8328-32 (1956).

Descriptors: *Mississippi, *Highways, *Drainage, *Flood damage, Surface drainage, Drainage engineering, Drainage practices, Surface waters, Bridges, Surface runoff, Drainage water, Flooding, Damages, Repairing, Maintenance, Legal aspects, Legislation, Planning.

The board of supervisors is authorized to drain water from public roads, through and over adjacent lands. Damages may be allowed to adjacent landowners. The Highway Commission is empowered to repair roadbed, surfacing and bridges being constructed as 'farm-to-market' projects, in accordance with provisions of the County Highway Aid Act of 1946. No provision was made in that act for repair of damage to roadbeds and bridges caused by excessive floods after construction but before final acceptance, and that omission is hereby remedied. (Kelly-Florida)
W70-00832

BRIDGES - GENERAL PROVISIONS.
For primary bibliographic entry see Field 04A.
W70-00833

MUSSELS.
Miss Code Ann secs 5913-5922 (1952).

Descriptors: *Mussels, *Permits, *Regulation, *Mississippi, Fishing gear, Freshwater, Aquatic animals, Legislation, Shellfish, Commercial shellfish, Wildlife conservation, Wildlife management, Fish conservation, Fish management, Fish, Administrative agencies, Legal aspects.
Identifiers: Mussel flats, Penalties (Criminal).

Ownership of all mussels found in fresh water is vested in the state. It shall be unlawful to take mussels without first obtaining a license. Mussels taken under three inches in length shall be returned to the water. If the mussels taken are to be used for scientific purposes, a permit must be obtained from the Director of Conservation. Anyone violating this act shall be guilty of a misdemeanor. (Darragh-Florida)
W70-00834

STREAM POLLUTION.
For primary bibliographic entry see Field 05G.
W70-00835

6F. Nonstructural Alternatives

ECONOMIC ANALYSIS OF ALTERNATIVE FLOOD CONTROL MEASURES BY DIGITAL COMPUTER,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 06A.
W70-00617

OPERATIONAL PROCEDURES FOR EVALUATING FLOOD PROTECTION BENEFITS,
Department of Agriculture, Washington, D.C.; and North Carolina State Univ., Raleigh.
R. A. Freund, and G. S. Tolley.
IN Economics and Public Policy in Water Resource Development, Ames, Iowa State University Press, p 150-170, 1964. 21 p, 1 fig, 9 tab, 4 ref. Edited by S. C. Smith, and E. N. Castle.

Descriptors: *Watersheds, *Economic analysis, *Economic evaluation, Planning, Floodwater, Benefits, Floodplain, Coastal plains, Income, Costs, Measurement, Crops, Streams, Hydrology, Data collection.
Identifiers: *Workplan, Tobacco, Cropland.

This article deals with a project write-up which presents alternative lines of development in floodplain agriculture. It is oriented to small watershed projects, since planning for these is similar to planning for larger projects, and is thus relevant to other water resource programs. As a result, a case can be made for adoption as a package of the modified workplan and a shortened evaluation method in watershed projects. The workplan calls for expanded economic content which recognizes that benefits cannot be predicted with certainty, and describes the alternative possible outcomes. The shortened evaluation method presents a less refined method of application which frees the economist for more extended work on the workplan. This plan enables economists to remain cognizant of trends affecting regional agriculture and the watershed planning. (Murphy-Rutgers)
W70-00625

THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
Chicago Univ., Ill.
For primary bibliographic entry see Field 06C.
W70-00628

FLOOD CONTROL POLICY AND FLOOD MANAGEMENT,
William Whipple, Jr.
New Jersey Water Resources Research Institute Report, Rutgers University, New Brunswick, New Jersey. Paper presented at Interstate Conference on Water Problems, Oct 17-18, 1968. 14 p.

Descriptors: *Flood control, *Flood plain management, *Non-structural alternative, *Flood plain insurance, *Flood plain zoning, Flood protection, Flood damage.
Identifiers: *Project-induced economic growth, Flood plain encroachment.

Total annual flood damages are increasing, due to encroachment upon flood plains. Reservoir flood control if often illusory, as project-induced growth recreates flood hazards. The Federal Flood Insurance Act of 1968 was advocated to control flood plain occupancy; but since it is both voluntary and subsidized it may actually increase flood plain occupancy. This flood insurance is essentially a financial palliative rather than a non-structural alternative. Zoning remains the essential alternative to structural flood control. Flood insurance may provide an incentive to zoning by the states if properly administered.
W70-00728

OPTIMUM INESTMENT IN STRUCTURAL FLOOD CONTROL,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W70-00729

COORDINATION OF URBAN PLANNING AND FLOOD PLAIN DEVELOPMENT,
For primary bibliographic entry see Field 06B.
W70-00751

THE INTERACTION OF URBAN REDEVELOPMENT AND FLOOD PLAIN MANAGEMENT IN WATERLOO, IOWA,
For primary bibliographic entry see Field 06B.
W70-00752

6G. Ecologic Impact of Water Development

LAND USE ALONG A TROPICAL CLIMATIC BOUNDARY: THE WALAWE GANGA BASIN OF CEYLON,
National Academy of Sciences-National Research Council, Washington, D.C.
For primary bibliographic entry see Field 03B.
W70-00463

PERSPECTIVES ON ENVIRONMENTAL PLANNING AND RESOURCE DEVELOPMENT,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 06B.
W70-00510

AN ENVIRONMENT FIT FOR PEOPLE,
Raymond F. Dasmann.
New York Public Affairs Committee, 1968. 28 p.

Descriptors: *Environment, *Conservation, Technology, Population, Wildlife, Ecology, Environment, Cities, Air pollution, Water pollution, Solid wastes, City planning, Soil erosion.
Identifiers: Urban space, Rural lands, Rangelands, Forest conservation, Marine environment.

We have made spectacular gains in our method for producing the needs and luxuries of life. But technological advances are being bought at the cost of increasing deterioration of the environment, pollution of air and water, crowding and congestion, loss of living space and destruction of natural environments. There is worry that even if man's material needs can be satisfied, the world he lives in will be less suited to maintaining those human qualities that make men fit company for one another. A concern for keeping the world a fit place for people is the basis for the social movement known as conservation. Like the environment, the meaning of conservation has been changing. The conservationist was once involved mostly with the natural world and the rural scene. Today the conservationist is also concerned with the concentration of population in towns and cities, the dangers of pollution, the population explosion, etc. Many of these areas of interest, such as in water pollution, have economic ramifications which must be considered by the conservationist. (Loeb-Rutgers)
W70-00603

NATURAL RESOURCES: QUALITY AND QUANTITY.

California, Berkeley and Los Angeles, University of California Press, 1967. 217 p. Edited by Ciriacy-Wantrup, S. V. and Parsons, James J.

Descriptors: *Natural resources, Quality control, Water quality, Value, Management, Land, Burning, Mineralogy, Public health, Air pollution, Wildlife management, Ecosystems, Administration, Planning.
Identifiers: *Quality, *Quantity, Interdisciplinary areas, Identification, Social systems, Air quality management, Public policy.

The essays composing this volume were first presented before an interdisciplinary faculty seminar at the University of California, Berkeley. The seminar was sponsored by the Chancellor's Committee on Natural Resources. The main concerns of the Committee were the effects of specialization and of an academic structure based on disciplines upon the advancement of interdisciplinary areas of study. The seminar was also to explore the possibilities for organizing interdisciplinary research on natural resources into an Institute of Natural Resources. The central theme of this volume concerns the problems of environmental quality and the relations between quality and quantity in the natural resources area. The three essays of Part I deal with the issue of identification. The difficulties of identifying the dimensions of quality are of a different order of magnitude from those involved in identifying the dimensions of quality are of a different order of magnitude from those involved in identifying the dimensions of water quality. The difference is that evaluation is involved. The seven essays of Part II are concerned with the type of quality dimensions illustrated by water quality. The essays of Part III deal with complex biological-social systems dominated by the two great evolutionary forces of mutation and selection. (See also W70-00606 thru W70-00612). (Loeb-Rutgers)
W70-00605

QUALITY IN THE CONTROL OF QUANTITY,
California Univ., Berkeley.
Lewis Mumford.
Natural Resources: Quality and Quantity, p 7-18, University of California Press, Berkeley and Los Angeles, 1967. 12 p.

Descriptors: Technology.
Identifiers: *Quality, *Quantity, Technological innovation, Science, Workmanship, Standardization, Mass production, Quantification.

The author contends that the problem of our age, which dominates or underlies most of its other problems is the problem of quality. The evidence increasingly shows that many technological innovations that have been regarded as indications of progress have actually been regressive in their effects, in that they have favored mechanical processes at the expense of human functions and human purposes. The author exposes the ideological misconceptions that have impelled us to promote the quantative expansion of knowledge, power and productivity, without inventing any adequate system of controls. The author further proposes to show that the deliberate disregard of qualities in the conceptual scheme of seventeenth century science has removed the complex, built-in controls which, though sometimes clumsy, had hitherto been effective. The idea might be useful in the water area in studies pertaining to water pollution and the quality of outdoor recreation associated with water resources. (See W70-00605). (Loeb-Rutgers)
W70-00606

RESOURCE QUALITY AND VALUE OF THE LANDSCAPE,
California Univ., Berkeley.
D. B. Luten.
Natural Resources: Quality and Quantity, p 19-34, University of California Press, Berkeley and Los Angeles, 1967. 16 p, 4 fig.

Descriptors: *Value, Natural resources, Water quality, Water management, Systematics, Boundaries, Ecosystems.
Identifiers: *Resource quality, *Landscape wilderness.

When we speak of the 'quality' of a natural resource at least two aspects may come to mind. The first is well symbolized by water. The 'quality' of water is often an issue in the management of water, but it can usually be measured in terms of the quantity of impurities. While the qualitative epithets 'good' or 'bad' may be applied to it, they always lead to the queries, 'How good,' 'How bad,' and these answers must be made in quantitative terms. In sharp contrast to this is the second aspect which compares the quality of a particular good relative to another. Two topics are examined in this essay. The first pertains to the divisions and boundaries within a discipline. Discipline divisions are usually separated by boundaries which indicate qualitative changes. For example, we might be interested in the division or border between soft and hard water, or between water of different degrees of purity. The final discussion in this article is an argument to justify the landscape itself especially the wilderness landscape, as a natural resource. The author contends that the wilderness is perhaps the most important of all resources, both in quality and quantity, because it is essential for the long-range welfare of men. Many economic studies in the water area are involved with the preservation of these natural resources and the improvement of the quality of them as well. (See W70-00605). (Loeb-Rutgers)
W70-00607

PROBLEMS OF QUALITY AND QUANTITY IN THE MANAGEMENT OF THE LIVING RESOURCES OF THE SEA,
California Univ., San Diego, La Jolla.
Milner B. Schaefer.
Natural Resources: Quality and Quantity, p 87-101, University of California Press, Berkeley and Los Angeles, 1967. 15 p, 3 fig, 11 ref.

Descriptors: *Water resources, *Foods, *Recreation, Sea water, Prices, Fisheries, California, Planning.
Identifiers: International considerations, Management problems, Marine resources, Quantity, Quality.

The primary use of the living resources of the sea is for protein food for direct human consumption. However, particularly important in the United States, and especially in California, is the use of the living resources of the sea for recreation. The pursuit of game fish species, such as tunas, marlin, yellowtail, bonito, flounders, and shore fish is enjoyed by large numbers of our citizens. A not negligible use of the sea's living resources is for the utility people derive from observing the larger animals in their natural habitat. A crude measurement of the quantity of the harvest of the sea is provided by the weight of the landed catch. The measurement of quality is a great deal more difficult, since quality depends not only on the inherent properties of an object but also on the attitude of the user. For organisms harvested commercially for human food, price is probably the most useful comparative measure of quality. Recreational uses depend very greatly on quality, but the quality of a recreational resource is difficult to measure. The author states, therefore, that it is probably useless to attempt to categorize the recreational resources with respect to quality. The article further discusses international considerations in the management of the living resources of the sea as well as the growth and potential of the world's fisheries, management problems and techniques and a marine resources planning study. (See W70-00605). (Loeb-Rutgers)
W70-00608

THE ECOSYSTEM AS A CONCEPTUAL TOOL IN THE MANAGEMENT OF NATURAL RESOURCES,
California Univ., Berkeley.
Arnold M. Schultz.
Natural Resources: Quality and Quantity, p 139-161, University of California Press, Berkeley and Los Angeles, 1967. 23 p.

Descriptors: *Ecosystems, *Natural resources, Ecology, Economics, Environment, Population, Organizations, Trophic level, Energy, Entropy, Stability, Land management.
Identifiers: *Resource management, Integrative levels, Mineral cycling, Steady state, Diversity, Capacity, Homeostasis, Park management.

Despite their connate derivation, ecology and economics are usually thought of as having little in common. One reason for this is the equivocal role assigned to man by ecologists compared with the assignment made by economists. The term 'natural' implies that there is no effective disturbance by man. Man excludes himself from nature, as he chooses. When his positive relations to the environment are stressed, the specialized term 'human ecology' is employed. In contrast, the term 'resource' carries the implication of a planning agent, a manager with a goal. Here man, individually or as

one of his social groupings, appraises the usefulness of his environment; in this role he makes decisions on whether or not and how to make effective disturbances in nature. A useful concept, recently developed, reaffirms the close connections between the two eco-sciences. This concept is called the ecosystem--a functional unit conveniently organized to study the general activities of production, distribution, exchange, and consumption. It might easily be applied to the water area since in this area man is virtually concerned with his positive relation to the environment so as to effect the production, distribution, exchange and consumption of various attributes of this sector. The main objective of the author is to show that it is logical to consider the manageable unit of human, cultural, and natural resources as an ecosystem. There are two secondary objectives. One is to straighten out the sometimes bewildering distinction between ecosystem and community. The other is to make a case for ecosystem study as a separate science. The important economic and ecological role of water makes this article relevant to the water researcher. (See W70-00605). (Loeb-Rutgers)
W70-00609

THE QUEST FOR QUALITY IN THE ADMINISTRATION OF RESOURCES,
California Univ., Berkeley.
Albert Lepawsky.
Natural Resources: Quality and Quantity, p 162-175, University of California Press, Berkeley and Los Angeles, 1967. 14 p.

Descriptors: *Administration, Mathematical studies, Natural resources, Benefits, Costs, Conservation, Cost-benefit analysis.
Identifiers: *Resources quality, *Quantification, Quantity, Quality, Policy formulation.

In the analysis and administration of natural resources, there is a tendency to counterpoise the attributes of quantity to those of quality. Some resource economists have even hypothesized an inverse relation between quantity and quality. Other resource scientists and most resource conservationists actually decry this sort of mathematical syndrome in modern mass society. They argue that the overemphasis upon quantity and quantification subordinates and depreciates the quality and character of resources and resource uses and deflects from the quest for values and standards. The growing concern for quality in the administration of natural resources arises in part from the new role of unconventional resources such as recreational amenities or space, where standards of measurement and criteria of evaluation lack precision. The search for quality is also a consequence of the sheer pressure upon resources of human numbers and needs, to a point where existing ways of living are either threatened or actually being qualitatively transformed. The paper discusses the potentialities of quantitative techniques as applied to resource administration and policy formulation. Such possible potentialities would be of value in the water area. (See W70-00605). (Loeb-Rutgers)
W70-00610

ON SOME MEANINGS OF 'PLANNING',
California Univ., Berkeley.
William Peterson.
Natural Resources: Quality and Quantity, p 176-196, University of California Press, Berkeley and Los Angeles, 1967. 21 p.

Descriptors: *Planning, Economics.
Identifiers: Five-year plan, Deductive planning, Marx, Engels, Socialism, Capitalism, Utopian planning, Inductive planning.

More and more of the social processes of the twentieth-century world are 'planned.' Five-year plans, once restricted to the Soviet Union, have spread not only to other Communist states but to such diverse countries as India and Brazil. In the United States the whole social-economic structure was altered by the government's response to the depression of the 1930's and to World War II. City planners have extended their purview to regions and then, through local, national, or international agencies, to the whole physical-social environment of human life. Planning has also extended its reach into the water area and the importance of water resources to planned development, particularly on a regional level, makes this article of interest to the water researcher. (See W70-00605). (Loeb-Rutgers)
W70-00611

PRESSURES OF GROWTH UPON ENVIRONMENT,
Washington Univ., St. Louis, Mo.
Harold J. Barnett.
Environmental Quality in a Growing Economy, Baltimore, Johns Hopkins Press, p 15-20, 1966. 6 p, 2 ref. Edited by H. Jarrett,

Descriptors: *Growth rates, *Environment, *Ecology, *Market value, *Decision making, Population, Shrinkage, Climates, Land, Income, Market value, Rent, Floods, Erosion, Landscaping, Value, Natural resources.
Identifiers: *Econosphere, *Congestion, *Economic history, Society, System, Synthetics, Laissez-faire, Free enterprise, Yield, Benefit-cost measurement.

This article proposes that a great increase in the size of the human ecology system will bring differences in both the nature and character of that system. At times when these tendencies have appeared, there has been a growth in perception of and discomfort from environmental congestion and damage, at which point the whole populace appears to want better quality in its environment. In the economic theory of a free enterprise economy, there is no necessary reason why due process appropriation of economic rent or land titles should interfere with classical economic efficiency nor why democratic decisions to place boundaries and rules on land use might not improve economic welfare. This article suggests that Presidential and Administration decisions to improve the quality of the environment are imminent and economic analysis should play a major role in determining the composition of these expenditures. Since water resources are a vital part of the changing environment, this article is of interest to the water resource planner. (Murphy-Rutgers)
W70-00618

THE SONORAN DESERT; ITS GEOGRAPHY, ECONOMY, AND PEOPLE,
Roger Dunbier.
University of Arizona Press, Tucson, 1968. 426 p.

Descriptors: *Water resources development, *Economy, *Social aspects, Deserts, Arid lands, Mexico, Southwest U.S., Arizona, Vegetation, Soils, Climates, History, Colorado River Basin.
Identifiers: *Sonoran Desert, Sonora, Salt River Valley (Ariz).

A regional geography that treats the economic development of the Sonoran Desert of North America. Chapters include; The Desert and Desert Landforms, Climate, Soils, Vegetation, Water, Social Evolution, The Mission Period, Westward Crossings, Water Resource Development, The Native Economy, The Mexican Economy, The American Economy, Political Factors, and A Pattern of Settlement. The water chapter reviews natural occurring waters. Areas of internal drainage and desert streams are treated along with floods and groundwater. Streams that originate outside the desert are considered by geographical subunits. The various aspects of water resources development in this area are treated under the general heading of Development of Groundwater, Lower Colorado Valley, Salt River Valley, Other Arizona Districts, and Development of Water Resources in Mexico. The overriding importance of water in the social, cultural and economic development of this desert is emphasized throughout. (Sherbrooke-Arizona)
W70-00700

THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
Wisconsin State Univ., Superior.
For primary bibliographic entry see Field 02I.
W70-00765

07. RESOURCES DATA

7A. Network Design

SOME METEOROLOGICAL REQUIREMENTS IN WATERSHED ENGINEERING RESEARCH,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
David M. Hershfield.
Proc 3rd Annu Amer Water Resources Conf, Nov 8-10, 1967, San Francisco, Calif, p 485-492, 1967. 8 p, 4 fig, 4 ref.

Descriptors: *Meteorological data, *Surveys, *Network design, Data collections, Watershed management, Rainfall, Runoff, Rainfall-runoff relationships, Duration curves, Depth-area curves, Depth-area-duration analysis, Distribution patterns, Rainfall disposition, Evapotranspiration.
Identifiers: Watershed engineering, Data requirements.

The major meteorological needs in the hydrologic phase of watershed engineering are for good estimates of various characteristics of precipitation and evapotranspiration. For precipitation this includes storm volume, depth-area relationship, time distribution, and the storm progression pattern. Only the first of these characteristics can be reliably estimated in well-instrumented research watersheds in most parts of the country. Similarly, estimates of several characteristics of evapotranspiration are required, foremost of which is areal estimates for short durations of time. This is one of the major problem areas in watershed research. (Knapp-USGS)
W70-00474

RADAR-COMPUTED RAINFALL COMPARED WITH OBSERVATIONS FROM A DENSE NETWORK OF RAIN GAUGES,
Environmental Technical Applications Center (Air Force), Washington, D.C.
Martin Ross.
USAF, Air Weather Service, ETAC Technical Note 69-4 June 1969. 11 p, 1 tab, 3 fig, 3 ref. Available from the Clearinghouse as USAF ETAC TN 69-4, $3.00 in paper copy, $0.65 in microfiche. AD-688 434.

Descriptors: *Radar-computed rainfall, *Rainfall intensity, Rainfall.
Identifiers: Precipitation.

Using Wilson's Rainfall Rate - Echo Intensity (RR-EI) chart, based on the average relationship, radar data collected for 36 hours, using the US Weather Bureau's WSR-57 at Atlantic City, New Jersey, are compared with rainfall data from three tipping-bucket rain gauges. These tipping-bucket gauges are located within 60 nm of the radar and cover a 4.8 square-mile area. Comparisons between the radar and tipping-bucket gauges are shown. Radar measurements were within 2% of the total rain gauge average. The correlation coefficient was .91. Use of the US Weather Bureau's RR-EI chart would have underestimated the average areal precipitation. Hourly rainfall amounts of 0.01 inches were detected in 80% of the cases. Hourly amounts of 0.02 inches or more were detected in 100% of the cases.
W70-00483

HYDROLOGICAL REQUIREMENTS FOR WEATHER RADAR DATA,
For primary bibliographic entry see Field 02B.
W70-00673

7B. Data Acquisition

DIRECT ILLUSTRATION OF ONE WAY SAND TRANSPORT BY TIDAL CURRENTS,
National Inst. of Oceanography, Wormley (England).
For primary bibliographic entry see Field 02J.
W70-00436

A DIVERSIFIED PROGRAM FOR THE STUDY OF SHALLOW WATER SEARCHING AND MAPPING TECHNIQUES,
Pennsylvania Univ., Philadelphia. Univ. Museum.
George F. Bass, and Donald M. Rosencrantz.
Available from Clearinghouse as AD-686 487 for $3 in paper copy, 65 cents in microfiche. Final Rep of Univ Museum, Penn Univ, Nov 1968. 130 p, 32 fig. ONR Contract N00014-67A-0216-0002.

Descriptors: *Remote sensing, *Underwater, *Oceanography, *Mapping, *Instrumentation, Surveys, Data collections, Reviews, Photography, Submarines, Photogrammetry.
Identifiers: Sonar mapping.

The capabilities of two side looking sonar systems were evaluated in waters ranging from 250 to 350 ft. Detected targets were visually examined using underwater television and the ASHERAH submersible. Two ancient shipwrecks were discovered as a result. A stereophotogrammetric mapping system was designed, and tested on the ASHERAH. It was demonstrated that it is possible to map extended areas of the ocean's floor using overlap stereophotography without the need for surveyed ground control data. Various photographic techniques, submersible handling and logistic problems, and underwater viewing systems including viewpoint optics are also discussed. (Knapp-USGS)
W70-00461

AN EXPERIMENTAL IN SITU DENSITOMETER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
Howard W. Kuenzler.
Available from Clearinghouse as AD 681 090 for $3 in paper copy, 65 cents in microfiche. Rep 68-3, Fluid Dynam Lab, Mass Inst Technol, Sept 1968. 56 p, 18 fig, 4 tab, 8 ref. ONR Contract NONR 1841 (74).

Descriptors: *Instrumentation, *Oceanography, *Water measurement, *Density, *Sea water, On-site tests, Calibrations, Electronic equipment, Measurement, Research equipment, Strain gages.
Identifiers: In situ densitometer (Water), Water density measurement.

A new prototype transducer capable of making direct measurements of fluid density in situ has been developed. The theory of design, the method of construction, and the performance in laboratory tests are discussed in view of its possible application as an oceanographic tool for precise measurement of seawater density. Present sensitivity is within an order of magnitude of the capabilities of indirect techniques currently being used for seawater. Suggestions are made for improving the precision, and indications are given that the device has potential as a sea-going oceanographic instrument. (Knapp-USGS)
W70-00462

OPTICAL OCEANOGRAPHY,
Copenhagen Univ. (Denmark). Inst. of Physical Oceanography.
N. G. Jerlov.
Amsterdam, Elsevier Publishing Co, 1968. 194 p, 83 fig, 28 tab, 294 ref.

Descriptors: *Oceanography, *Sea water, *Optical properties, Light, Refractivity, Turbidity, Dispersion, Albedo, Solar radiation, Absorption, Bioluminescence, Instrumentation, Analytical techniques, Photosynthesis, Water pollution effects, Color.
Identifiers: *Optical oceanography.

Optical oceanography is defined, discussed in detail, and existing literature on the subject is reviewed in a comprehensive monograph. The properties of sea water, including light absorption, scattering, polarization, attenuation, albedo, refraction, radiation, color, and visibility are explained. Instrumentation, techniques of study, applications of optical methods, uses of research, and biological studies are discussed. Fundamental data for the study of photosynthesis are given. These include solar radiation, transparency, effect of particles on light scattering and absorption, bioluminescence, and water pollution effects. (Knapp-USGS)
W70-00464

TRACTIONABILITY STUDY FOR THE LAOTIAN PANHANDLE,
Environmental Technical Applications Center (Air Force), Washington, D.C.
For primary bibliographic entry see Field 02G.
W70-00484

AN INEXPENSIVE METHOD FOR DETERMINING THE DIRECTION OF NATURAL FLOW OF GROUNDWATER,
Irrigation Research Inst., Lahore (Pakistan).
For primary bibliographic entry see Field 02F.
W70-00635

APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
Syracuse Univ. Research Corp., N.Y.
Daniel G. Hickman, and John E. Hogg.
Remote Sensing of Environ, Vol 1, No 1, p 47-58, Mar 1969. 12 p, 14 fig, 1 tab, 10 ref.

Descriptors: *Bathymetry, *Shores, *Lakes, *Measurement, *Remote sensing, *Aircraft, Lake Ontario, Water storage, Turbidity, Velocity.
Identifiers: Airborne pulsed laser, Bathymetric measurements.

Feasibility of using a pulsed blue-green laser as an airborne Bathymetric sensor for near-shore beach reconnaissance surveys was investigated by using an experimental water tank and a laser transmitter-receiver system flown over the shores of Lake Ontario. Water depths to 26 ft were recorded in the study; maximum depth capability of the laser system is limited by turbidity of the water. In fairly clear water the depth-measuring capability is about 120 ft. The shallow water resolution is 1.5 ft. An aircraft flying at 300 miles/hr could obtain data points every 20 ft over an area of 5-50 sq miles each hr. (Gabriel-USGS)
W70-00636

THERMAL STRATIFICATION IN THE ARCTIC OCEAN,
Oregon State Univ., Corvallis; and Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 02C.
W70-00638

OPTICAL METHOD FOR DETERMINING PARTICLE SIZES OF COARSE SEDIMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02J.
W70-00655

HYDROLOGICAL REQUIREMENTS FOR WEATHER RADAR DATA,
For primary bibliographic entry see Field 02B.
W70-00673

WATER BUDGET STUDIES IN KARST AQUIFERS,
McMaster Univ., Hamilton (Ontario). Dept. of Geography; and Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02F.
W70-00676

RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research and Regional Survey.
For primary bibliographic entry see Field 02E.
W70-00698

MEASURING ANGLES WITH A CARPENTER'S FOLDING RULER,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. Martinelli, Jr., and R. A. Schmidt, Jr.
USDA Forest Service Research Note RM 152, 1969. 2 p, 1 tab.

Descriptors: *Equipment, *Research equipment, *Surveying instruments, Colorado.
Identifiers: *Field protractor, Measurement of angles, Ruler.

A table is given that permits marking 6-foot and 2-meter folding rulers so they can be used to measure angles directly. Accuracy varies from 2 1/2 to 5 degrees. (Martinelli-Forest Service)
W70-00760

7C. Evaluation, Processing and Publication

GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W70-00440

A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH VALIDITY TESTING OF A COMPARATIVE-PROJECTOR MODEL,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06A.
W70-00479

SNOWY RANGE WATER RESOURCE OBSERVATORY (A Progress Report).
Wyoming Univ., Laramie.

Wyoming Univ Water Resources Research Institute, Water Resources Series No 15, Sept, 1969. 50 p, 1 tab, 1 fig, 3 ref, append. Paul A. Rechard, Ed.

Descriptors: *Instrumentation, *Data processing, Watersheds, *Operation and maintenance.
Identifiers: Anemometers, *Computers, Evaporation pans, Gages, Hygrothermographs, Observation wells, Precipitation gages, Pyrheliographs, Pyrometers, Soil moisture meters, Thermometers.

The instrumentation within the Snowy Range Water Resource Observatory is described. Some of the problems of operating and maintaining the instruments are discussed. Methods of portraying the data collected are presented and the ADP card format and computer program for processing hygrothermograph records is given. Resumes of single discipline research within the observatory during 1966-1969 are given, together with some conclusions as to interdisciplinary considerations.
W70-00480

OPTIMUM ALLOCATION OF WATER RESOURCES BY MATHEMATICAL PROGRAMMING,
Rand Water Board, Johannesburg (South Africa).
For primary bibliographic entry see Field 06A.
W70-00641

COMPUTER-ORIENTED METHOD OF OPTIMIZING HYDROLOGIC MODEL PARAMETERS,
Soil Conservation Service, Chickasha, Okla. Southern Plains Branch; and Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 06A.
W70-00642

APPLICATION OF THE SPECTRAL ANALYSIS METHOD TO THE PRE-ESTIMATION OF TIDES (IN RUSSIAN),
For primary bibliographic entry see Field 02L.
W70-00643

SELECTED WATER RESOURCES INDEX FOR WISCONSIN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 10.
W70-00767

08. ENGINEERING WORKS

8A. Structures

INDIANA BOARD OF PUBLIC HARBORS AND TERMINALS.
For primary bibliographic entry see Field 06E.
W70-00591

CASTAWAYS MOTEL V SCHUYLER (PERMISSION TO BUILD A BULKHEAD).
For primary bibliographic entry see Field 06E.
W70-00735

8B. Hydraulics

FLUID DYNAMICS OF MULTIPHASE SYSTEMS,
Illinois Univ., Urbana. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02F.
W70-00469

8C. Hydraulic Machinery

APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
Central Creil Exploitation Service (France); and Departments of Tests and Thermal Studies (France).
For primary bibliographic entry see Field 04A.
W70-00679

8D. Soil Mechanics

DIFFERENTIAL EQUATION OF THE EVOLUTION OF DELUVIAL SLOPES (IN RUSSIAN),
Kazan State Univ. (USSR). Dept. of Geography.
For primary bibliographic entry see Field 02J.
W70-00648

8E. Rock Mechanics and Geology

THE PROPOSED SOLWAY FIRTH BARRAGES: A REVIEW OF THE GEOLOGICAL AND GEOTECHNICAL ASPECTS,
Ministry of Agriculture and Water, Riyadh (Saudi Arabia).
For primary bibliographic entry see Field 04A.
W70-00646

PORE STUDIES OF HIGHLY INDURATED APPALACHIAN ROCKS,
Virginia Univ., Charlottesville. Dept. of Geology; Virginia Highway Research Council, Charlottesville; and Cities Service Oil Co., Tulsa, Okla.
For primary bibliographic entry see Field 02F.
W70-00659

8I. Fisheries Engineering

NETS AND SEINES, STURGEON, SHAD, AND HERRING SEASON.
For primary bibliographic entry see Field 06E.
W70-00585

FISH AND GAME.
For primary bibliographic entry see Field 06E.
W70-00588

FISH AND GAME.
For primary bibliographic entry see Field 06E.
W70-00593

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER-RELATED RESEARCH FOR THE GREAT LAKES REGION,
Michigan Univ., Ann Arbor. Dept. of Conservation; and Michigan Univ., Ann Arbor. Inst. of Science and Technology.
For primary bibliographic entry see Field 02H.
W70-00433

SELECTED WATER RESOURCES INDEX FOR WISCONSIN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 10.
W70-00767

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT FISCAL YEAR 1968-69,
William Whipple, Jr.
New Jersey Water Resources Research Institute Report, Rutgers University - The State University, New Brunswick, New Jersey, July 1969. 68 p.

Descriptors: *Research grants, *Research facilities, *Water resources development, Economics, Urbanization, Biochemical oxygen demand, Dissolved oxygen.
Identifiers: *Water resources research administration, Oxygen dynamics of streams, Instream aeration, Interdisciplinary research.

A report on research and training activities of the New Jersey Water Resources Research Institute during fiscal year 1969 under provisions of PL 88-379. Includes mainly activities at Rutgers University, with participation in some projects by Princeton University and Stevens Institute. Thirty projects active, funded mainly by Office of Water Resources Research and the Federal Water Pollution Control Administration, with matching funds from the New Jersey Department of Conservation and Economic Development. The chosen theme of the institute is metropolitan area water resources, and the two major fields of activity are: (1) Oxygen dynamics and biochemical oxygen demand of streams including instream aeration, and (2) Economics of water resources.
W70-00733

ANNUAL REPORT 1968-1969.
Hawaii Univ., Honolulu. Water Resources Research Center.

Hawaii Water Resources Research Center Report, Aug 1969. 121 p. OWRR Project A-999-HI.

Descriptors: *Hawaii, Floods, *Hydrogeology, Aquifer characteristics, *Geophysical exploration, Well logging, Groundwater tides, Groundwater recharge, *Groundwater pollution, Water color, Tracers, Estuarine pollution, Hydrologic data, Irrigation, Evapotranspiration, Water values.

Annual progress report on the research program of the University of Hawaii Water Resources Research Center: the work reported includes studies of floods in small watersheds, aspects of the geohydrology of certain areas on Oahu, Maui, and Hawaii, surface and aerial geophysical exploration for groundwater and geophysical well logging, tidal oscillations in groundwater, identification of groundwater pollution effects, the pollution of certain estuaries, the removal of color from surface water, water tracing and dating, the design of hydrologic data network, the water use of sugar cane, and the value of water for irrigating sugar cane. (Cox-Hawaii Univ)
W70-00764

10. SCIENTIFIC AND TECHNICAL INFORMATION

A CLIMATOLOGICAL BIBLIOGRAPHY OF THE SOUTH ATLANTIC OCEAN AREA, INCLUDING CERTAIN COASTAL COUNTRIES,
Environmental Technical Applications Center (Air Force) Washington, D.C.
Alvin L. Smith, Jr.
USAF, Air Weather Service, ETAC Technical Note 68-4, Nov 1968. 100 p, 262 ref. Available from the Clearinghouse as USAF ETAC TN 68-4, $3.00 in paper copy, $0.65 in microfiche. AD-683 761.

Descriptors: *Climatology, *Bibliography.
Identifiers: South Atlantic Ocean Area, S. Atlantic Coastal Countries.

This bibliography contains climatological references, with annotations, for the South Atlantic Ocean Area, Atlantic Coastal Countries of Africa and S. America, and Antarctica. Items are indexed by author (alphabetically), by country or areas, and by weather parameters (code).
W70-00481

AN ANNOTATED CLIMATOLOGICAL BIBLIOGRAPHY OF ROMANIA,
Environmental Technical Applications Center (Air Force), Washington, D.C.
Vincent J. Creasi.
USAF, Air Weather Service, ETAC Tech Note 69-3, May 1969. 33 p, 61 ref, subject index. Available from the Clearinghouse as USAF ETAC TN 69-3, $3.00 in paper copy, $0.65 in microfiche. AD-688 259.

Descriptors: *Bibliography, *Climatology.
Identifiers: Romania.

This bibliography contains 61 separate sources on climatological data and textual references for

Romania. All entries are in alphabetical order by author or originating agency. All items are furnished with a brief abstract. A subject index of the times is included. All items indicate the source library where the reference is filed.
W70-00482

BENEFIT-COST ANALYSIS FOR WATER RESOURCE PROJECTS: A SELECTED ANNOTATED BIBLIOGRAPHY,
Tennessee Valley Authority, Washington, D.C.
For primary bibliographic entry see Field 06B.
W70-00495

WATER RESOURCE INFORMATION FOR PLANNING AND MANAGEMENT,
Illinois Geological Survey.
For primary bibliographic entry see Field 06B.
W70-00515

SEWAGE FUNGUS: ITS NATURE AND EFFECTS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05C.
W70-00637

BACTERIA, CARBON DIOXIDE, AND ALGAL BLOOMS,
Wyandotte Chemical Corp., Mich.
For primary bibliographic entry see Field 05C.
W70-00664

PESTICIDES AND FISHES--A REVIEW OF SELECTED LITERATURE,
Arizona State Univ., Tempe. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W70-00718

SELECTED WATER RESOURCES INDEX FOR WISCONSIN,
Wisconsin Univ., Madison.
P. D. Uttormark, L. J. Nunnelee, and L. C. Utter.
Available from the Clearinghouse as PB-187 312 $3.00 in paper copy, $0.65 in microfiche. Also available for $3.00 per copy from University of Wisconsin Water Resources Center, Madison, Wisconsin. Wisconsin Water Resource Center, July 1969. 222 p, key word index, author index. OWRR Project A-999-WIS.

Descriptors: *Wisconsin, *Bibliographies, *Documentation, Publications.

This index was prepared to aid those concerned with water resources in Wisconsin and is designed to answer two basic questions: (1) 'What information is available,' and (2) 'Where is this information located.' The source material for this index is limited to that found at the University of Wisconsin at Madison and only those references which pertain directly to Wisconsin are included. Although an attempt was made to be thorough in preparing this index, no doubt some references have been omitted. Without question, the compilation of a comprehensive index, pertaining to water and related resources of Wisconsin, would be of significant value as a basis for solving many of the state's water resources problems. Although this publication is not comprehensive, hopefully it will provide stimulus for additional effort. (Rohlich-Wisconsin Univ)
W70-00767

SUBJECT INDEX

ABSTRACTS
AIR POLLUTION PUBLICATIONS - A SELECTED BIBLIOGRAPHY WITH ABSTRACTS, 1966-1968.
W70-00452 05G

EFFECTS OF FERTILIZERS ON WATER QUALITY.
W70-00717 05C

ABU DHABI
POWER, WATER AND FOOD FOR DESERT COASTS AN INTEGRATED SYSTEM FOR PROVIDING THEM,
W70-00694 03A

ACCESS ROUTES
COMPENSATION FOR THE RIGHT OF ACCESS TO NAVIGABLE WATERS,
W70-00566 04A

THE RIGHT OF ACCESS TO NAVIGABLE WATERS--COMPENSABILITY UNDER EMINENT DOMAIN,
W70-00567 04A

ACCIDENT PREVENTION
CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

ACCIDENTS
OPERATION AND EQUIPMENT OF VESSELS.
W70-00586 06E

CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

ACCRETION
THE WANDERING MISSOURI RIVER A STUDY IN ACCRETION LAW,
W70-00780 06E

ACCRETION(LEGAL ASPECTS)
REAL PROPERTY--ALLUVION AND ACCRETION--ARTICLE 509 OF THE LOUISIANA CIVIL CODE,
W70-00560 06E

DETERMINATION OF RIGHTS TO REAL PROPERTY ALONG THE MISSOURI RIVER IN CONNECTION WITH RIVER STABILIZATION,
W70-00572 04A

THE WANDERING MISSOURI RIVER A STUDY IN ACCRETION LAW,
W70-00777 06E

W70-00778 06E

W70-00779 06E

NAVIGABLE WATERS--RIGHT OF RIPARIAN OWNER TO ARTIFICIAL ACCRETION,
W70-00798 04A

RIPARIAN RIGHTS - RIGHT TO FOLLOW ACCRETIONS ACROSS FIXED BOUNDARY LINE.
W70-00803 04A

ACID MINE WATER
NEUTRALIZATION OF ACID MINE DRAINAGE,
W70-00662 05D

AD VALOREM TAX
THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
W70-00766 05G

ADJACENT LANDOWNERS
WATER AND WATERCOURSES--RIPARIAN RIGHTS AS APPLIED TO ARTIFICIAL WATERCOURSES,
W70-00523 06E

ADMINISTRATION
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 8 FEDERAL AUTHORITY AND ACTIVITY AFFECTING FLORIDA'S WATER RESOURCES,
W70-00535 06E

THE QUEST FOR QUALITY IN THE ADMINISTRATION OF RESOURCES,
W70-00610 06G

ADMINISTRATIVE AGENCIES
LEVEES.
W70-00485 04A

PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.
W70-00508 06E

W70-00516 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 9 STATE ADMINISTRATION OF WATER RESOURCES IN FLORIDA,
W70-00536 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 10 SINGLE PURPOSE AND MULTIPURPOSE WATER MANAGEMENT DISTRICTS,
W70-00537 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 11 THE LAW AND ADMINISTRATION OF POLLUTION CONTROL IN FLORIDA,
W70-00538 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 13 A LOOK TO THE FUTURE,
W70-00540 04A

POLLUTION OF WATERS OF THE STATE THE STREAM POLLUTION CONTROL BOARD OF THE STATE OF INDIANA.
W70-00579 05G

POLLUTION OF WATERS OF STATE.
W70-00580 05G

W70-00581 06E

DUTIES OF MINNESOTA LAND EXCHANGE COMMISSION.
W70-00588 06E

DRAINAGE MAINTENANCE AND REPAIR DISTRICTS.
W70-00594 04A

DRAINS RIGHT-OF-WAYS--OBSTRUCTIONS--CROSSINGS--CONNECTIONS.
W70-00595 04A

INDIANA DEEP WATERWAYS COMMISSION.
W70-00596 04A

PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.
W70-00599 06E

DRAINAGE DISTRICTS UNDER 1911 ACT.
W70-00715 04A

DRAINAGE DISTRICTS UNDER 1911 ACT ORGANIZATION, POWERS AND EMPLOYEES OF COMMISSION FEES, ETC.
W70-00759 04A

COMMISSIONERS OF HEALTH AND DRAINAGE IN CERTAIN COUNTIES.
W70-00788 04A

STATUTES-EXTENT OF THE AUTHORITY OF THE DEPARTMENT OF CONSERVATION.
W70-00800 04A

ILLINOIS DRAINAGE LAW (A COMMENTARY),
W70-00815 04A

LEVEES.
W70-00818 04A

W70-00819 04A

W70-00820 06E

FLOOD CONTROL ACT.
W70-00827 04A

W70-00828 04A

W70-00829 04A

ADVECTION
ADVECTIVE CONTRIBUTION OF ENERGY UTILIZED IN EVAPOTRANSPIRATION BY ALFALFA IN THE EAST CENTRAL GREAT PLAINS (U.S.A.),
W70-00690 02D

ADVERSE POSSESSION
WATER AND WATERCOURSES--RIPARIAN RIGHTS AS APPLIED TO ARTIFICIAL WATERCOURSES,
W70-00523 06E

AGGREGATE PRODUCTION FUNCTION
REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

AGRICULTURAL WATERSHEDS
EFFECTS OF FERTILIZERS ON WATER QUALITY.
W70-00717 05C

AGRICULTURE
AGRICULTURAL METEOROLOGY IN ISRAEL,
W70-00691 03F

THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
W70-00693 06B

AGROMETEOROLOGY
AGRICULTURAL METEOROLOGY IN ISRAEL,
W70-00691 03F

AIR POLLUTION
AIR POLLUTION PUBLICATIONS - A SELECTED BIBLIOGRAPHY WITH ABSTRACTS, 1966-1968.
W70-00452 05G

AIRCRAFT
APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
W70-00636 07B

AIR-WATER INTERFACE
PATTERNS OF THE THERMAL REGIME OF THE SURFACE LAYER OF WATER,
W70-00741 02D

ALABAMA
GROUNDWATER RESOURCES OF THE PASCAGOULA RIVER BASIN,

MISSISSIPPI AND ALABAMA,
W70-00477 02F

REAL PROPERTY--EASEMENTS--CONSTRUCTION OF INSTRUMENT GRANTING RIGHT OF FLOWAGE,
W70-00548 04A

NAVIGABLE WATERS--RIGHT OF RIPARIAN OWNER TO ARTIFICIAL ACCRETION,
W70-00798 04A

ALASKA
HYDROLOGIC EFFECTS OF THE EARTHQUAKE OF MARCH 27, 1964, OUTSIDE ALASKA,
W70-00467 02E

ALFALFA
ADVECTIVE CONTRIBUTION OF ENERGY UTILIZED IN EVAPOTRANSPIRATION BY ALFALFA IN THE EAST CENTRAL GREAT PLAINS (U.S.A.),
W70-00690 02D

ALGAE
BACTERIA, CARBON DIOXIDE, AND ALGAL BLOOMS,
W70-00664 05C

ECOLOGICAL FACTORS AND THE DISTRIBUTION OF CLADOPHORA GLOMERATA IN THE GREAT LAKES,
W70-00667 05C

ALIENATION OF BEDS
CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
W70-00526 06E

ALLUVION
CIVIL LAW PROPERTY--ALLUVION DISTINGUISHING LAKES FROM RIVERS AND STREAMS,
W70-00541 04D

ALLUVIUM
REAL PROPERTY--ALLUVION AND ACCRETION--ARTICLE 509 OF THE LOUISIANA CIVIL CODE,
W70-00560 06E

DIFFERENTIAL EQUATION OF THE EVOLUTION OF DELUVIAL SLOPES (IN RUSSIAN),
W70-00648 02J

AMU-DAR'YA BASIN
IRRIGATION IN THE AMU-DAR'YA BASIN PROGRESS REPORT,
W70-00705 03F

ANALYSIS
SUCCESS OF WATERSHED DEVELOPMENT IN LOCAL COMMUNITIES,
W70-00497 06B

ANALYTICAL TECHNIQUES
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

RADIOMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF SELENIUM USING 3, 3' -DIAMINOBENZIDINE AS THE INITIAL REAGENT,
W70-00460 05A

DETERMINATION OF PHENOXY ACID HERBICIDES IN WATER BY ELECTRON-CAPTURE AND MICROCOULOMETRIC GAS CHROMATOGRAPHY,
W70-00473 05A

OPTICAL METHOD FOR DETERMINING PARTICLE SIZES OF COARSE SEDIMENT,
W70-00655 02J

ANDROS ISLAND(BAHAMAS)
ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
W70-00445 02J

ANTIMYCIN A
EFFECTS OF TOXICANTS ON COMMUNITY METABOLISM IN POOLS,
W70-00710 05C

APPALACHIAN MOUNTAIN REGION
PORE STUDIES OF HIGHLY INDURATED APPALACHIAN ROCKS,
W70-00659 02F

AQUATIC LIFE
STATE OWNERSHIP AND SALE OF SEA SHELLS.
W70-00739 06E

WATER USE AND THERMAL POLLUTION,
W70-00742 05C

AQUEDUCTS
THE QANATS OF IRAN,
W70-00692 04B

AQUIFERS
GROUND-WATER CONDITIONS IN MCMULLEN VALLEY, MARICOPA, YUMA AND YAVAPAI COUNTIES, ARIZONA,
W70-00426 02F

GEOLOGY OF THE REGOLITH AQUIFERS OF THE NISHNABOTNA BASIN,
W70-00458 02F

WATER BUDGET STUDIES IN KARST AQUIFERS,
W70-00676 02F

THE QANATS OF IRAN,
W70-00692 04B

ARCTIC
URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
W70-00424 02H

ARCTIC OCEAN
THERMAL STRATIFICATION IN THE ARCTIC OCEAN,
W70-00638 02C

ARID LANDS
AGRICULTURAL METEOROLOGY IN ISRAEL,
W70-00691 03F

THE QANATS OF IRAN,
W70-00692 04B

THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
W70-00693 06B

POWER, WATER AND FOOD FOR DESERT COASTS AN INTEGRATED SYSTEM FOR PROVIDING THEM,
W70-00694 03A

MICRO-IRRIGATION BY CATCHMENT TANK,
W70-00701 03B

NOTES ON PROBLEMS OF IRRIGATION IN THREE LIBYAN OASES,
W70-00703 04B

IRRIGATION IN THE AMU-DAR'YA BASIN PROGRESS REPORT,
W70-00705 03F

WATER SUPPLY, USE AND MANAGEMENT,
W70-00706 04B

ARIZONA
GROUND-WATER CONDITIONS IN MCMULLEN VALLEY, MARICOPA, YUMA AND YAVAPAI COUNTIES, ARIZONA,
W70-00426 02F

STRUCTURE OF THE ARIZONA ECONOMY OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
W70-00697 06B

ARKANSAS
WATER RESOURCES OF RANDOLPH AND LAWRENCE COUNTIES, ARKANSAS,
W70-00420 02E

FISH AND GAME.
W70-00588 06E

A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
W70-00678 05G

ARMY CORPS OF ENGINEERS
POTENTIAL SOCIOLOGICAL RESEARCH IN WATER RESOURCES DEVELOPMENT,
W70-00757 06B

ARTESIAN WELLS
NOTES ON PROBLEMS OF IRRIGATION IN THREE LIBYAN OASES,
W70-00703 04B

ARTIFICIAL POLLUTION
DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00544 05G

ARTIFICIAL WATERCOURSES
WATER AND WATERCOURSES--RIPARIAN RIGHTS AS APPLIED TO ARTIFICIAL WATERCOURSES,
W70-00523 06E

RIPARIAN RIGHTS IN ARTIFICIAL LAKES AND STREAMS,
W70-00797 04A

ASSETS
ASSET PRICES IN ECONOMIC ANALYSIS,
W70-00626 06C

ATLANTIC OCEAN
INDIANA DEEP WATERWAYS COMMISSION.
W70-00596 04A

ATTITUDES
DEVELOPING POSITIVE PUBLIC ATTITUDES FOR WATER RESOURCE DEVELOPMENT,
W70-00514 06B

SOCIAL PROBLEMS NEEDING SOLUTIONS, STATE AGENCIES,
W70-00758 06B

AUCKLAND
SEDIMENTOLOGY OF THE WAITEMATA GROUP IN THE STANLEY POINT-DEVONPORT AREA, AUCKLAND, NEW ZEALAND,
W70-00652 02J

SEDIMENTARY FEATURES AND PENECONTEMPORANEOUS SLUMPING IN THE WAITEMATA GROUP, WHANGAPARAOA PENINSUAL, NORTH AUCKLAND, NEW ZEALAND,
W70-00653 02J

AUSTRALIA
RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
W70-00698 02E

WATER RESOURCES PLANNING IN AUSTRALIA,
W70-00704 06B

AVULSION
THE WANDERING MISSOURI RIVER A STUDY IN ACCRETION LAW,
W70-00777 06E

W70-00778 06E

W70-00779 06E

W70-00780 06E

BACTERIA
SEASONAL SELECTION OF ESTUARINE BACTERIA BY WATER TEMPERATURE,
W70-00713 05C

BAD DEBT LOSSES
CREDIT AND COLLECTION POLICIES AT EUGENE, OREGON,
W70-00597 06C

BALANCE OF NATURE
WATER USE AND THERMAL POLLUTION,
W70-00742 05C

BATHYMETRY
APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
W70-00636 07B

BEACHES
ENVIRONMENTALLY SIGNIFICANT SEDIMENTOLOGIC CHARACTERISTICS OF BEACH SANDS,
W70-00650 02L

RELATIONSHIPS BETWEEN GRAIN SIZE, SIZE-SORTING, AND FORESHORE SLOPE ON MIXED SAND-SHINGLE BEACHES,
W70-00651 02L

BEDS
CASTAWAYS MOTEL V SCHUYLER (PERMISSION TO BUILD A BULKHEAD).
W70-00735 06E

ISLANDS AND ABANDONED RIVER CHANNELS.
W70-00817 04A

BEDS UNDER WATER
OWNERSHIP OF BEDS POWER TO CONVEY WHEN STATE HAS TITLE.
W70-00547 06E

BENEFICIAL USE
IOWA WATER LAW PROBLEMS TO BE CONSIDERED.
W70-00573 06E

BENEFITS
THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

BENEFIT-COST RATIO
SOME OBSERVATIONS ON ECONOMIC EVALUATION STUDIES,
W70-00499 06C

BIBLIOGRAPHIES
AIR POLLUTION PUBLICATIONS - A SELECTED BIBLIOGRAPHY WITH ABSTRACTS, 1966-1968.
W70-00452 05G

BENFFIT-COST ANALYSIS FOR WATER RESOURCE PROJECTS A SELECTED ANNOTATED BIBLIOGRAPHY,
W70-00495 06B

PESTICIDES AND FISHES--A REVIEW OF SELECTED LITERATURE,
W70-00718 05C

SELECTED WATER RESOURCES INDEX FOR WISCONSIN,
W70-00767 10

BIBLIOGRAPHY
A CLIMATOLOGICAL BIBLIOGRAPHY OF THE SOUTH ATLANTIC OCEAN AREA, INCLUDING CERTAIN COASTAL COUNTRIES,
W70-00481 10

AN ANNOTATED CLIMATOLOGICAL BIBLIOGRAPHY OF ROMANIA,
W70-00482 10

BIOCHEMICAL OXYGEN DEMAND
BIOCHEMICAL OXYGEN DEMAND AND DEGRADATION OF LIGNIN IN NATURAL WATERS,
W70-00681 05B

BIOINDICATORS
THE USE OF INVERTEBRATES IN A WATER QUALITY INVESTIGATION A BIOLOGICAL STUDY OF THE MIAMI RIVER, OHIO,
W70-00475 05C

THE USE OF ARTIFICIAL SUBSTRATES IN POLLUTION SURVEYS,
W70-00666 05B

BOAT WASTES
BACTERIOLOGICAL EFFECT OF SMALL BOAT WASTES ON SMALL HARBORS,
W70-00722 05C

BOATING
SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

BOATING REGULATIONS
OPERATION AND EQUIPMENT OF VESSELS.
W70-00586 06E

WATER NAVIGATION REGULATIONS.
W70-00587 06E

BOGS
RUNOFF FROM SMALL PEATLAND WATERSHEDS,
W70-00675 02E

BONDS
DRAINAGE AND RECLAMATION ACT OF 1912.
W70-00823 04A

BOUNDARIES(PROPERTY)
REAL PROPERTY--EASEMENTS--CONSTRUCTION OF INSTRUMENT GRANTING RIGHT OF FLOWAGE,
W70-00548 04A

WATER BOUNDARIES,
W70-00570 04A

DETERMINATION OF RIGHTS TO REAL PROPERTY ALONG THE MISSOURI RIVER IN CONNECTION WITH RIVER STABILIZATION,
W70-00572 04A

BOUNDARY DISPUTES
CONCURRENT JURISDICTION OF A NAVIGABLE BOUNDARY RIVER.
W70-00524 06E

BREAKWALLS
CASTAWAYS MOTEL V SCHUYLER (PERMISSION TO BUILD A BULKHEAD).
W70-00735 06E

BRIDGE CONSTRUCTION
COMMISSIONERS OF STEAMSHIP TERMINALS.
W70-00809 06E

BRIDGES - GENERAL PROVISIONS.
W70-00833 04A

BRIDGES
BRIDGES - GENERAL PROVISIONS.
W70-00833 04A

BROOK TROUT
GROWTH AND RESISTANCE TO STRESS IN BROOK TROUT FED SUBLETHAL LEVELS OF DDT,
W70-00684 05C

BRULE RIVER BASIN
THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
W70-00765 02I

BUDGETING
EFFICIENCY IN GOVERNMENT SPENDING,
W70-00615 06B

BULKHEADS
CASTAWAYS MOTEL V SCHUYLER (PERMISSION TO BUILD A BULKHEAD).
W70-00735 06E

BURNT RIVER VALLEY(OREGON)
GROUNDWATER RECONNAISSANCE IN THE BURNT RIVER VALLEY AREA, OREGON,
W70-00468 02F

CALIFORNIA
REDUCING LAND SUBSIDENCE IN THE WILMINGTON OIL FIELD BY THE USE OF SALINE WATERS,
W70-00447 05G

OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
W70-00711 02H

EQUAL FOOTING AND THE MARGINAL SEA,
W70-00804 04A

CANADA
THE USE OF RADON-222 IN SURFACE WATERS IN GEOCHEMICAL PROSPECTING FOR URANIUM,
W70-00421 02J

AN ORIENTATION STUDY OF THE URANIUM DISTRIBUTION IN LAKE WATERS, BEAVERLODGE DISTRICT, SASKATCHEWAN,
W70-00423 02H

URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
W70-00424 02H

CANAL SEEPAGE
DETERMINATION OF DEPENDENCE BETWEEN FILTRATION CHARACTERISTICS OF DRAINAGE CANALS (IN RUSSIAN),
W70-00663 04A

IRRIGATION IN THE AMU-DAR'YA BASIN PROGRESS REPORT,
W70-00705 03F

CANALS
DETERMINATION OF DEPENDENCE BETWEEN FILTRATION CHARACTERISTICS OF DRAINAGE CANALS (IN RUSSIAN),
W70-00663 04A

CANALS AND WATERWAYS.
W70-00814 04A

CAPITAL
COST OF CAPITAL TO THE SMALL FIRM,
W70-00616 06C

CARBON DIOXIDE
BACTERIA, CARBON DIOXIDE, AND ALGAL BLOOMS,
W70-00664 05C

CARBONATE ROCKS
EXPERIMENTAL DISSOLUTION OF CALCIUM, MAGNESIUM, AND STRONTIUM FROM RECENT BIOGENIC CARBONATES A MODEL OF DIAGENESIS,
W70-00444 02K

LIMESTONE HYDROLOGY IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
W70-00451 02F

HYDROLOGY OF CARBONATE ROCK TERRANES, A REVIEW-WITH SPECIAL REFERENCE TO THE UNITED STATES (PART 1),
W70-00454 02F

PORE STUDIES OF HIGHLY INDURATED APPALACHIAN ROCKS,
W70-00659 02F

CATCHMENT TANKS
MICRO-IRRIGATION BY CATCHMENT TANK,
W70-00701 03B

CATTLE
NITROGEN CONTAMINATION OF GROUNDWATER BY BARNYARD LEACHATES,
W70-00665 05B

CENTRAL ASIA
IRRIGATION IN THE AMU-DAR'YA BASIN PROGRESS REPORT,
W70-00705 03F

CEYLON
LAND USE ALONG A TROPICAL CLIMATIC BOUNDARY THE WALAWE GANGA BASIN OF CEYLON,
W70-00463 03B

CHANNEL IMPROVEMENT
KANKAKEE LANDS.
W70-00517 06E

CHANNEL MORPHOLOGY
STATISTICAL ANALYSIS OF MEANDERING RIVER GEOMETRY,
W70-00725 02E

CHANNELS
WEST CENTRAL MISSISSIPPI WATERWAY COMMISSION.
W70-00738 06E

CHEMICAL ANALYSIS
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

RADIOMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF SELENIUM USING 3, 3' -DIAMINOBENZIDINE AS THE INITIAL REAGENT,
W70-00460 05A

A NOTE ON THE DEPENDENCE BETWEEN THE CONCENTRATION OF CHLORIDE IONS AND THE RADIOACTIVITY OF EMANATION DISSOLVED IN MINERAL WATERS (IN POLISH),
W70-00668 05A

OIL POLLUTION OF THE SEA DETECTION.
W70-00795 05A

CHEMICAL PROPERTIES
SOME CHARACTERISTICS OF THE WATERS OF GEORGIAN MUD VOLCANOES (IN RUSSIAN),
W70-00670 02K

CHEMICAL REACTIONS
DIAGENESIS, CHEMICAL SEDIMENTS, AND THE MIXING OF NATURAL WATERS,
W70-00674 02K

CHICAGO
THE CHICAGO WATER DIVERSION CONTROVERSY,
W70-00554 04D

CHILE
THE WATER RESOURCES OF CHILE AN ECONOMIC METHOD FOR ANALYZING A KEY RESOURCE IN A NATION'S DEVELOPMENT,
W70-00699 06B

CHLORIDES
A NOTE ON THE DEPENDENCE BETWEEN THE CONCENTRATION OF CHLORIDE IONS AND THE RADIOACTIVITY OF EMANATION DISSOLVED IN MINERAL WATERS (IN POLISH),
W70-00668 05A

CITY PLANNING
COORDINATION OF URBAN PLANNING AND FLOOD PLAIN DEVELOPMENT,
W70-00751 06B

CLAIMS
CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

CLAMS
DEPOSITION OF CLASTIC SEDIMENTS BY CLAMS,
W70-00442 02J

NATURAL RESOURCES (OYSTERS AND CLAMS).
W70-00811 06E

CLASSIFICATION
CIVIL LAW PROPERTY--ALLUVION DISTINGUISHING LAKES FROM RIVERS AND STREAMS,
W70-00541 04D

HUNTING AND FISHING LICENSES.
W70-00807 06E

CLEAN AIR ACT
FEDERAL AIR AND WATER CONTROL THE APPLICATION OF THE COMMERCE POWER TO ABATE INTERSTATE AND INTRASTATE POLLUTION,
W70-00771 05G

CLEANING
OIL POLLUTION OF THE SEA CLEANING UP.
W70-00796 05D

CLIMATES
SURFACE WATER AND RELATED CLIMATE FEATURES OF THE SAHIL SUSAH AREA, TUNISIA,
W70-00471 02E

CLIMATOLOGY
LAND USE ALONG A TROPICAL CLIMATIC BOUNDARY THE WALAWE GANGA BASIN OF CEYLON,
W70-00463 03B

A CLIMATOLOGICAL BIBLIOGRAPHY OF THE SOUTH ATLANTIC OCEAN AREA, INCLUDING CERTAIN COASTAL COUNTRIES,
W70-00481 10

AN ANNOTATED CLIMATOLOGICAL BIBLIOGRAPHY OF ROMANIA,
W70-00482 10

EVAPOTRANSPIRATION CLIMATONOMY 1. A NEW APPROACH TO NUMERICAL PREDICTION OF MONTHLY EVAPOTRANSPIRATION, RUNOFF, AND SOIL MOISTURE STORAGE,
W70-00654 02D

CLOSED CONDUIT FLOW
CONOBRE V FRITSCH (NATURAL WATERCOURSES).
W70-00720 04A

COLLECTION
CREDIT AND COLLECTION POLICIES AT EUGENE, OREGON,
W70-00597 06C

COLOR
THE APPEARANCE AND ORIGIN OF COLOURS IN MUDDY MARINE SEDIMENTS AROUND NEW ZEALAND,
W70-00661 02L

COLUMBIA RIVER
CHARACTERISTICS OF COLUMBIA RIVER SEDIMENT AND SEDIMENT TRANSPORT,
W70-00446 02J

COMMERCIAL FISHING
NETS AND SEINES, STURGEON, SHAD, AND HERRING SEASON.
W70-00585 06E

COMMERCIAL SHELLFISH
NATURAL RESOURCES (OYSTERS AND CLAMS).
W70-00811 06E

COMMON LAW
THE GREAT POND ORDINANCE--COLLECTIVISM IN NORTHERN NEW ENGLAND,
W70-00522 06E

WATER BOUNDARIES,
W70-00570 04A

IRRIGATION IN KENTUCKY AS AFFECTED BY THE LAW OF RIPARIAN RIGHTS,
W70-00571 03F

COMMON-LAW RIPARIAN RIGHTS
RIPARIAN RIGHTS IN FLORIDA,
W70-00555 06E

W70-00556 06E

COMMUNITY METABOLISM
EFFECTS OF TOXICANTS ON COMMUNITY METABOLISM IN POOLS,
W70-00710 05C

COMMUNITY RESPIRATION
EFFECTS OF TOXICANTS ON COMMUNITY METABOLISM IN POOLS,
W70-00710 05C

COMPENSATION
MUNICIPAL CORPORATIONS-WATERS AND WATERCOURSES-EMINENT DOMAIN-POLLUTION OF WATER AS A 'TAKING' OF PRIVATE PROPERTY,
W70-00520 05G

EMINENT DOMAIN--NAVIGATIONAL SERVITUDE--EFFECT ON EVALUATION OF PORT SITE PROPERTY,
W70-00545 06E

THE APPROPRIATION OF PROPERTY FOR LEVEES A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
W70-00563 04A

W70-00564 04A

THE RIGHT OF ACCESS TO NAVIGABLE WATERS--COMPENSABILITY UNDER EMINENT DOMAIN,
W70-00567 04A

COMPENSATION FOR TAKING OF FLOWAGE EASEMENTS BY CONDEMNATION,
W70-00781 04A

PUBLIC RIGHT AND THE RULE OF NO COMPENSATION,
W70-00785 04A

COMPETING USES

A FRESH APPROACH TO WATER LAW,
W70-00768 06B

COMPUTERS
SNOWY RANGE WATER RESOURCE OBSERVATORY (A PROGRESS REPORT).
W70-00480 07C

CONDEMNATION
THE NAVIGATION SERVITUDE AND JUST COMPENSATION--STRUGGLE FOR A DOCTRINE,
W70-00559 04A

THE APPROPRIATION OF PROPERTY FOR LEVEES A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
W70-00562 04A

W70-00563 04A

W70-00564 04A

COMPENSATION FOR TAKING OF FLOWAGE EASEMENTS BY CONDEMNATION,
W70-00781 04A

CONDEMNATION VALUE
THE APPROPRIATION OF PROPERTY FOR LEVEES A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
W70-00562 04A

FRONTIER TOWN PROPERTIES, INC V STATE (CONDEMNATION VALUE OF WATER USE).
W70-00805 06C

CONGESTION
PRESSURES OF GROWTH UPON ENVIRONMENT,
W70-00618 06G

CONNECTICUT
CERTAIN FERRIES OPERATED BY CONNECTICUT.
W70-00808 06E

COMMISSIONERS OF STEAMSHIP TERMINALS.
W70-00809 06E

SHOREFRONT PARK IMPROVEMENT ASSOCIATION, INC V KING (RIPARIAN RIGHTS AND RESTRICTIONS ON THE RIPARIAN LAND).
W70-00812 06E

CONSERVATION
REMOVAL OF VEGETATION FROM WATERCOURSES.
W70-00437 04A

DEPARTMENT OF CONSERVATION.
W70-00583 04C

AN ENVIRONMENT FIT FOR PEOPLE,
W70-00603 06G

SOIL AND WATER CONSERVATION DISTRICTS LAW.
W70-00736 03F

CONSTITUTIONAL LAW
FEDERAL ENCROACHMENT ON STATE WATER RIGHTS,
W70-00549 06E

CONSTRUCTION
LEVEES.
W70-00820 06E

CONSTRUCTION COSTS
COST OF MUNICIPAL SEWAGE TREATMENT,
W70-00493 05D

CONSUMER SURPLUS
SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

CONSUMPTIVE USE
RESEARCH IN EVAPOTRANSPIRATION,
W70-00450 02D

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 5 CONSUMPTIVE USE OF WATER COMMON LAW RULES,
W70-00532 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 6 STATUTORY MODIFICATIONS OF EASTERN CONSUMPTIVE USE DOCTRINES,
W70-00533 06E

CONTINENTAL SHELF
RECENT SEDIMENTATION AROUND NORTHERNMOST NEW ZEALAND,
W70-00645 02J

OFF-SHORE SEDIMENTS, NORTH-WEST NELSON, SOUTH ISLAND, NEW ZEALAND,
W70-00660 02L

SEDENTARY FISHERIES AND ARTICLE 2(4) OF THE CONVENTION ON THE CONTINENTAL SHELF - A PLEA FOR A SEPARATE REGIME,
W70-00772 06E

UNITED STATES LEGISLATION RELATING TO THE CONTINENTAL SHELF,
W70-00773 06E

CONTROL
STAGE-DISCHARGE CHARACTERISTICS OF A WEIR IN A SAND-CHANNEL STREAM,
W70-00418 02E

A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
W70-00678 05G

CONVEXITY
ALLOCATION OF RESOURCES AND THE PRICE SYSTEM,
W70-00631 06B

COOLING TOWER THEORY
PERFORMANCE OF NATURAL-DRAUGHT WATER COOLING TOWERS,
W70-00745 05D

COOLING TOWERS
PERFORMANCE OF NATURAL-DRAUGHT WATER COOLING TOWERS,
W70-00745 05D

COOLING WATER
EFFECTS OF INTRODUCTION OF HEATED WATER ON STREAMS (IN GERMAN),
W70-00748 05C

CORRELATION ANALYSIS
QUANTITATIVE STATISTICAL ANALYSES OF COLUMBIA RIVER SEDIMENT SAMPLES,
W70-00438 02J

CORRELATION AND ANALYSIS OF WATER-TEMPERATURE DATA FOR OREGON STREAMS,
W70-00470 02E

COST ALLOCATION
COST ALLOCATION IN RELATION TO WESTERN WATER POLICIES,
W70-00633 06C

COST ANALYSIS
COST OF MUNICIPAL SEWAGE TREATMENT,
W70-00493 05D

COST OF CAPITAL
COST OF CAPITAL TO THE SMALL FIRM,
W70-00616 06C

COSTS
CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

PRODUCTION COST FACTOR IN RATE-MAKING,
W70-00602 06C

COST OF CAPITAL TO THE SMALL FIRM,
W70-00616 06C

THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

COST-BENEFIT ANALYSIS
COST-BENEFIT ANALYSIS SELECTED ISSUES,
W70-00487 05G

EXTERNALITIES AND THE QUALITY OF AIR AND WATER,
W70-00490 05G

FEDERAL NATURAL RESOURCES DEVELOPMENT BASIC ISSUES IN BENEFIT AND COST MEASUREMENT,
W70-00494 06B

BENEFIT-COST ANALYSIS FOR WATER RESOURCE PROJECTS A SELECTED ANNOTATED BIBLIOGRAPHY,
W70-00495 06B

EFFICIENCY IN GOVERNMENT SPENDING,
W70-00615 06B

COST-EFFECTIVENESS
GOVERNMENT RESEARCH AND DEVELOPMENT PROGRAMS,
W70-00621 06B

COVENANTS
CASTAWAYS MOTEL V SCHUYLER (PERMISSION TO BUILD A BULKHEAD).
W70-00735 06E

CREDIT
CREDIT AND COLLECTION POLICIES AT EUGENE, OREGON,
W70-00597 06C

CULVERTS
BRIDGES - GENERAL PROVISIONS.
W70-00833 04A

CURRENTS(WATER)
GEOMORPHOLOGY OF A SAND RIDGE,
W70-00453 02J

OFF-SHORE SEDIMENTS, NORTH-WEST NELSON, SOUTH ISLAND, NEW ZEALAND,
W70-00660 02L

CYANOPHYTES
THE ISOLATION, PURIFICATION, AND NUTRIENT SOLUTION REQUIREMENTS OF BLUE-GREEN ALGAE,
W70-00719 05C

CYCLING
THE ROLE OF PHYTOPLANKTON IN THE CYCLING OF RADIONUCLIDES IN THE MARINE ENVIRONMENT,
W70-00708 05C

DAMAGES
OIL POLLUTION OF THE SEA THE EFFECTS OF POLLUTION.
W70-00789 05C

OIL POLLUTION OF THE SEA PRIVATE REMEDIES.
W70-00793 05G

DAMS
THE PROPOSED SOLWAY FIRTH BARRAGES A REVIEW OF THE GEOLOGICAL AND GEOTECHNICAL ASPECTS,
W70-00646 04A

DATA COLLECTIONS
SURFACE-WATER RESOURCES OF THE YOBE RIVER SYSTEM, NORTHERN NIGERIA, 1963-68,
W70-00456 02A

HYDROLOGIC EFFECTS OF THE EARTHQUAKE OF MARCH 27, 1964, OUTSIDE ALASKA,
W70-00467 02E

SURFACE WATER IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00689 02E

DATA PROCESSING
SNOWY RANGE WATER RESOURCE OBSERVATORY (A PROGRESS REPORT).
W70-00480 07C

DECISION MAKING
TAXATION AND THE DISPOSITION OF DEPRECIABLE ASSETS,
W70-00600 06C

PRESSURES OF GROWTH UPON ENVIRONMENT,
W70-00618 06G

DEEP WATER
OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
W70-00711 02H

DENSITY
AN EXPERIMENTAL IN SITU DENSITOMETER,
W70-00462 07B

DEPOSITION(SEDIMENTS)
DEPOSITION OF CLASTIC SEDIMENTS BY CLAMS,
W70-00442 02J

GRAIN SIZE DISTRIBUTIONS AND DEPOSITIONAL PROCESSES,
W70-00639 02J

DEPRECIABLE ASSETS
TAXATION AND THE DISPOSITION OF DEPRECIABLE ASSETS,
W70-00600 06C

DESALINATION
POWER, WATER AND FOOD FOR DESERT COASTS AN INTEGRATED SYSTEM FOR PROVIDING THEM,
W70-00694 03A

PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
W70-00726 03A

DESALINATION APPARATUS
PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
W70-00726 03A

DESERTS
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

DETECTION
OIL POLLUTION OF THE SEA DETECTION.
W70-00795 05A

DEUTERIUM
THE EXCHANGE OF HYDROGEN ISOTOPES BETWEEN ICE AND WATER IN TEMPERATURE GLACIERS,
W70-00439 02K

DEVELOPMENT PROGRAMS
MEASURING BENEFITS OF GOVERNMENT INVESTMENTS.
W70-00622 06B

DIAGENESIS
HYDROLOGY OF SOUTH BONAIRE, N. A. - A ROCK SELECTIVE DOLOMITIZATION MODEL,
W70-00441 02F

EXPERIMENTAL DISSOLUTION OF CALCIUM, MAGNESIUM, AND STRONTIUM FROM RECENT BIOGENIC CARBONATES A MODEL OF DIAGENESIS,
W70-00444 02K

ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
W70-00445 02J

DIAGENESIS, CHEMICAL SEDIMENTS, AND THE MIXING OF NATURAL WATERS,
W70-00674 02K

DIELDRIN
ACCUMULATION OF DIELDRIN BY FISH AND SELECTED FISH-FOOD ORGANISMS,
W70-00714 05C

DIGITAL COMPUTERS
ECONOMIC ANALYSIS OF ALTERNATIVE FLOOD CONTROL MEASURES BY DIGITAL COMPUTER,
W70-00617 06A

DIQUAT
EFFECTS OF TOXICANTS ON COMMUNITY METABOLISM IN POOLS,
W70-00710 05C

DISCHARGE MEASUREMENT
RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
W70-00698 02E

DISPERSION
LAWS OF DISPERSION,
W70-00732 01A

AN EXPERIMENTAL RESEARCH OF COEFFICIENT OF LONGITUDINAL DISPERSION FOR SMALL RIVERS (IN RUSSIAN),
W70-00743 05B

DISSOLVED OXYGEN
THE USE OF INVERTEBRATES IN A WATER QUALITY INVESTIGATION A BIOLOGICAL STUDY OF THE MIAMI RIVER, OHIO,
W70-00475 05C

DISTRIBUTION PATTERNS
A CLIMATOLOGICAL EVALUATION OF PRECIPITATION PATTERNS,
W70-00740 04C

DITCHES
DRAINAGE MAINTENANCE AND REPAIR DISTRICTS.
W70-00594 04A

RIGHTS OF WAY FOR DRAINAGE.
W70-00775 04A

DIVERSION
THE CHICAGO WATER DIVERSION CONTROVERSY,
W70-00554 04D

DIVESTMENT
RIPARIAN RIGHTS IN FLORIDA,
W70-00555 06E

W70-00558 06E

DOCUMENTATION
SELECTED WATER RESOURCES INDEX FOR WISCONSIN,
W70-00767 10

DOLLAR MEASURE
OUTDOOR RECREATION,
W70-00623 06B

DOLOMITE
HYDROLOGY OF SOUTH BONAIRE, N. A. - A ROCK SELECTIVE DOLOMITIZATION MODEL,
W70-00441 02F

DOLOMITIZATION
HYDROLOGY OF SOUTH BONAIRE, N. A. - A ROCK SELECTIVE DOLOMITIZATION MODEL,
W70-00441 02F

DRAINAGE
INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
W70-00422 02J

KANKAKEE LANDS.
W70-00517 06E

ILLINOIS DRAINAGE CODE.
W70-00737 06E

RIGHTS OF WAY FOR DRAINAGE.
W70-00775 04A

COMMISSIONERS OF HEALTH AND DRAINAGE IN CERTAIN COUNTIES.
W70-00788 04A

DRAINAGE OF WATER FROM PUBLIC ROADS AND REPAIR OF FLOOD DAMAGE TO CERTAIN ROADS.
W70-00832 06E

DRAINAGE BASIN ANALYSIS
GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
W70-00440 02E

DRAINAGE DISTRICTS
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 10 SINGLE PURPOSE AND MULTIPURPOSE WATER MANAGEMENT DISTRICTS,
W70-00537 06E

PROVISIONS AS TO DITCHES, DRAINAGE, AND RECLAMATION.
W70-00590 04A

DRAINAGE MAINTENANCE AND REPAIR DISTRICTS.
W70-00594 04A

DRAINAGE DISTRICTS UNDER 1911 ACT.
W70-00715 04A

ILLINOIS DRAINAGE CODE.
W70-00737 06E

DRAINAGE DISTRICTS UNDER 1911 ACT ORGANIZATION, POWERS AND EMPLOYEES OF COMMISSION FEES, ETC.
W70-00759 04A

ILLINOIS DRAINAGE LAW (A COMMENTARY),
W70-00815 04A

DRAINAGE AND RECLAMATION ACT OF 1912.
W70-00821 04A

W70-00822 04A

W70-00823 04A

W70-00824 04A

W70-00825 04A

DRAINAGE ENGINEERING
DETERMINATION OF DEPENDENCE BETWEEN FILTRATION CHARACTERISTICS OF DRAINAGE CANALS (IN RUSSIAN),
W70-00663 04A

DRAINAGE PROGRAMS
PROVISIONS AS TO DITCHES, DRAINAGE, AND RECLAMATION.
W70-00590 04A

DRAINAGE AND RECLAMATION ACT OF 1912.
W70-00821 04A

W70-00822 04A

W70-00823 04A

W70-00824 04A

W70-00825 04A

INTERSTATE DRAINS.
W70-00830 04A

DRAINAGE SYSTEMS
IRRIGATION IN THE AMU-DAR'YA BASIN PROGRESS REPORT,
W70-00705 03F

ILLINOIS DRAINAGE LAW (A COMMENTARY),
W70-00815 04A

DRAINAGE WATER
COMMON LAW RIGHTS TO SURFACE WATERS,
W70-00799 04A

DREDGING
STATE OWNERSHIP AND SALE OF SEA SHELLS.
W70-00739 06E

DUCK CREEK
COORDINATION OF URBAN PLANNING AND FLOOD PLAIN DEVELOPMENT,
W70-00751 06B

DUST STORMS
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

DYNAMITE FISHING
FISH NOT TO BE KILLED OR TAKEN BY EXPLOSIVES.
W70-00831 06E

EARTHQUAKES
HYDROLOGIC EFFECTS OF THE EARTHQUAKE OF MARCH 27, 1964, OUTSIDE ALASKA,
W70-00467 02E

EASEMENTS
DEPARTMENT OF CONSERVATION.
W70-00583 04C

DRAINS RIGHT-OF-WAYS--OBSTRUCTIONS--CROSSINGS--CONNECTIONS.
W70-00595 04A

RIVER AND HARBOR IMPROVEMENTS.
W70-00696 04A

COMPENSATION FOR TAKING OF FLOWAGE EASEMENTS BY CONDEMNATION,
W70-00781 04A

WATERS AND WATERCOURSES - EASEMENTS - IMPLIED DEDICATION OF FLOWAGE EASEMENT APPURTENANT TO A DAM,
W70-00802 04A

PIERCE V RILEY (UNREASONABLE EXTENSION OF RIPARIAN RIGHTS).
W70-00813 06E

EASEMENTS OF FLOWAGE
REAL PROPERTY--EASEMENTS--CONSTRUCTION OF INSTRUMENT GRANTING RIGHT OF FLOWAGE,
W70-00548 04A

ECOLOGY
PRESSURES OF GROWTH UPON ENVIRONMENT,
W70-00618 06S

ECOLOGICAL FACTORS AND THE DISTRIBUTION OF CLADOPHORA GLOMERATA IN THE GREAT LAKES,
W70-00667 05C

COMPARATIVE ECOLOGY OF SANDSPIT PONDS,
W70-00671 02L

THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
W70-00765 02I

ECONOMIC ANALYSIS
GOVERNMENT RESEARCH AND DEVELOPMENT PROGRAMS,
W70-00621 06B

REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

OPERATIONAL PROCEDURES FOR EVALUATING FLOOD PROTECTION BENEFITS,
W70-00625 06F

ASSET PRICES IN ECONOMIC ANALYSIS,
W70-00626 06C

ECONOMIC BENEFITS
ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
W70-00730 05G

ECONOMIC EFFICIENCY
ECONOMIC EFFECTS OF USING SUBSTANDARD QUALITY WATER IN WEBSTER AND OTHER COMMUNITIES IN SOUTH DAKOTA.
W70-00727 03C

ECONOMIC EVALUATION
OPERATIONAL PROCEDURES FOR EVALUATING FLOOD PROTECTION BENEFITS,
W70-00625 06F

ECONOMIC GROWTH
REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
W70-00693 06B

ECONOMIC HISTORY
PRESSURES OF GROWTH UPON ENVIRONMENT,
W70-00618 06G

ECONOMIC KNOWLEDGE
THREE ESSAYS ON THE STATE OF ECONOMIC SCIENCE,
W70-00630 06B

ECONOMIC PREDICTION
A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH VALIDITY TESTING OF A COMPARATIVE-PROJECTOR MODEL,
W70-00479 06A

ECONOMIC REGIONAL DEVELOPMENT
COMMENT ON THE PLACE OF WATER RESOURCES PLANNING IN ECONOMIC REGIONAL DEVELOPMENT,
W70-00614 06B

ECONOMIC RESEARCH
ANTICIPATING THE NATIONS NEED FOR ECONOMIC KNOWLEDGE,
W70-00620 6B

ECONOMIC SITE ADVANTAGE
OPTIMUM INESTMENT IN STRUCTURAL FLOOD CONTROL,
W70-00729 06B

ECONOMICS
A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH VALIDITY TESTING OF A COMPARATIVE-PROJECTOR MODEL,
W70-00479 06A

CREDIT AND COLLECTION POLICIES AT EUGENE, OREGON,
W70-00597 06C

ECONOMIC ANALYSIS OF ALTERNATIVE FLOOD CONTROL MEASURES BY DIGITAL COMPUTER,
W70-00617 06A

ANTICIPATING THE NATIONS NEED FOR ECONOMIC KNOWLEDGE,
W70-00620 6B

IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
W70-00627 03F

THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

THREE ESSAYS ON THE STATE OF ECONOMIC SCIENCE,
W70-00630 06B

ALLOCATION OF RESOURCES AND THE PRICE SYSTEM,
W70-00631 06B

THE INTERACTION OF TOOLS AND PROBLEMS IN ECONOMICS,
W70-00632 06B

THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
W70-00693 06B

STRUCTURE OF THE ARIZONA ECONOMY OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
W70-00697 06B

ECONOMICS OF WATER POLLUTION
ECONOMICS OF AIR AND WATER POLLUTION.
W70-00486 05G

ECONOMY
THE SONORAN DESERT ITS GEOGRAPHY, ECONOMY, AND PEOPLE,
W70-00700 06G

ECONOSPHERE
PRESSURES OF GROWTH UPON ENVIRONMENT,

W70-00618 06G

ECOSYSTEMS
THE ECOSYSTEM AS A CONCEPTUAL TOOL IN THE MANAGEMENT OF NATURAL RESOURCES,
W70-00609 06G

POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
W70-00709 05C

EFFLUENTS
RESEARCH GOALS AND PROGRESS TOWARD THEM,
W70-00619 05G

ELECTRIC POWER
PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.
W70-00496 06E

ELECTROCHEMISTRY
PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
W70-00726 03A

ELECTRODIALYSIS
PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
W70-00726 03A

ELECTRONIC EQUIPMENT
THERMAL STRATIFICATION IN THE ARCTIC OCEAN,
W70-00638 02C

EMINENT DOMAIN
EMINENT DOMAIN--NAVIGATIONAL SERVITUDE--EFFECT ON EVALUATION OF PORT SITE PROPERTY,
W70-00545 06E

THE NAVIGATION SERVITUDE AND JUST COMPENSATION--STRUGGLE FOR A DOCTRINE,
W70-00559 04A

THE RIGHT OF ACCESS TO NAVIGABLE WATERS--COMPENSABILITY UNDER EMINENT DOMAIN,
W70-00567 04A

POLLUTION OF WATERS OF STATE.
W70-00578 05G

W70-00581 06E

PUBLIC RIGHT AND THE RULE OF NO COMPENSATION,
W70-00785 04A

FRONTIER TOWN PROPERTIES, INC V STATE (CONDEMNATION VALUE OF WATER USE).
W70-00805 06C

EMPIRICAL INVESTMENT
REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

ENGINEERING
WATER-RESOURCES ENGINEERING,
W70-00634 06D

ENGLAND AND WALES
INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
W70-00422 02J

ENVIRONMENT
AN ENVIRONMENT FIT FOR PEOPLE,
W70-00603 06G

PRESSURES OF GROWTH UPON ENVIRONMENT,
W70-00618 06G

RESEARCH GOALS AND PROGRESS TOWARD THEM,
W70-00619 05G

TRITIUM IN THE ENVIRONMENT FROM NUCLEAR POWERPLANTS,
W70-00716 05B

ENVIRONMENTAL EFFECTS
ENVIRONMENTAL SURVEILLANCE AROUND A NUCLEAR FUEL REPROCESSING INSTALLATION, 1965-1967,
W70-00677 05C

ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
W70-00730 05G

ENVIRONMENTAL ENGINEERING
PERSPECTIVES ON ENVIRONMENTAL PLANNING AND RESOURCE DEVELOPMENT,
W70-00510 06B

ENVIRONMENTAL PLANNING
PERSPECTIVES ON ENVIRONMENTAL PLANNING AND RESOURCE DEVELOPMENT,
W70-00510 06B

ENVIRONMENTAL SURVEILLANCE
ENVIRONMENTAL SURVEILLANCE AROUND A NUCLEAR FUEL REPROCESSING INSTALLATION, 1965-1967,
W70-00677 05C

EQUIPMENT
MEASURING ANGLES WITH A CARPENTER'S FOLDING RULER,
W70-00760 07B

ERIE-NIAGARA BASIN(NY)
A RECONNAISSANCE OF STREAM SEDIMENT IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00466 02J

ERODIBILITY
ERODIBILITY OF SAND-CLAY MIXTURES AS EVALUATED BY A WATER JET,
W70-00724 02J

EROSION
TIDAL FLAT EROSION BY ICE AT LA POCATIERE, ST. LAWRENCE ESTUARY,
W70-00640 02L

EARTHFLOW OCCURRENCE DURING HIGH INTENSITY RAINFALL IN EASTERN OTAGO (NEW ZEALAND),
W70-00647 02B

DIFFERENTIAL EQUATION OF THE EVOLUTION OF DELUVIAL SLOPES (IN RUSSIAN),
W70-00648 02J

RIPARIAN RIGHTS - RIGHT TO FOLLOW ACCRETIONS ACROSS FIXED BOUNDARY LINE.
W70-00803 04A

EROSION CONTROL
ERODIBILITY OF SAND-CLAY MIXTURES AS EVALUATED BY A WATER JET,
W70-00724 02J

SOIL AND WATER CONSERVATION DISTRICTS LAW.
W70-00736 03F

ESTABLISHMENT AND SURVIVAL OF SEVERAL GRASSES IN THE SAGEBRUSH TYPE, WEST-CENTRAL NEW MEXICO,
W70-00762 04D

ESTOPPEL
RIPARIAN RIGHTS IN ARTIFICIAL LAKES AND STREAMS,
W70-00797 04A

ESTUARIES
ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
W70-00419 02L

ESTUARINE LAND OF NORTH CAROLINA LEGAL ASPECTS OF OWNERSHIP, USE, AND CONTROL,
W70-00565 06E

TIDAL FLAT EROSION BY ICE AT LA POCATIERE, ST. LAWRENCE ESTUARY,
W70-00640 02L

THE PROPOSED SOLWAY FIRTH BARRAGES A REVIEW OF THE GEOLOGICAL AND GEOTECHNICAL ASPECTS,
W70-00646 04A

ESTUARINE ENVIRONMENT
SEASONAL SELECTION OF ESTUARINE BACTERIA BY WATER TEMPERATURE,
W70-00713 05C

EUTROPHICATION
BACTERIA, CARBON DIOXIDE, AND ALGAL BLOOMS,
W70-00664 05C

ECOLOGICAL FACTORS AND THE DISTRIBUTION OF CLADOPHORA GLOMERATA IN THE GREAT LAKES,
W70-00667 05C

EVAPORATION
COMPUTATION OF THE COMPONENTS OF THE THERMAL BALANCE OF PLANNED RESERVOIRS,
W70-00744 02D

EVAPORATION CONTROL
POWER, WATER AND FOOD FOR DESERT COASTS AN INTEGRATED SYSTEM FOR PROVIDING THEM,
W70-00694 03A

EVAPOTRANSPIRATION
RESEARCH IN EVAPOTRANSPIRATION,
W70-00450 02D

EVAPOTRANSPIRATION CLIMATONOMY 1. A NEW APPROACH TO NUMERICAL PREDICTION OF MONTHLY EVAPOTRANSPIRATION, RUNOFF, AND SOIL MOISTURE STORAGE,
W70-00654 02D

ADVECTIVE CONTRIBUTION OF ENERGY UTILIZED IN EVAPOTRANSPIRATION BY ALFALFA IN THE EAST CENTRAL GREAT PLAINS (U.S.A.),
W70-00690 02D

EXPLORATION
THE USE OF RADON-222 IN SURFACE WATERS IN GEOCHEMICAL PROSPECTING FOR URANIUM,
W70-00421 02J

EXPLOSIVES
FISH NOT TO BE KILLED OR TAKEN BY EXPLOSIVES.
W70-00831 06E

EXTERNALITIES
COST-BENEFIT ANALYSIS SELECTED ISSUES,
W70-00487 05G

EXTERNALITIES AND THE QUALITY OF AIR AND WATER,
W70-00490 05G

FARM OUTPUT
REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

FARM WASTES
NITROGEN CONTAMINATION OF GROUNDWATER BY BARNYARD LEACHATES,
W70-00665 05B

FEDERAL GOVERNMENT
THE NAVIGATION SERVITUDE AND JUST COMPENSATION--STRUGGLE FOR A DOCTRINE,
W70-00559 04A

GOVERNMENT RESEARCH AND DEVELOPMENT PROGRAMS,
W70-00621 06B

NAVIGABLE WATERS--RIGHT OF RIPARIAN OWNER TO ARTIFICIAL ACCRETION,
W70-00798 04A

EQUAL FOOTING AND THE MARGINAL SEA,
W70-00804 04A

FEDERAL JURISDICTION
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 2 RIGHTS IN DEFINED WATERBODIES BASIC CONSIDERATIONS,
W70-00529 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 8 FEDERAL AUTHORITY AND ACTIVITY AFFECTING FLORIDA'S WATER RESOURCES,
W70-00535 06E

FEDERAL ENCROACHMENT ON STATE WATER RIGHTS,
W70-00549 06E

FEDERAL AIR AND WATER CONTROL THE APPLICATION OF THE COMMERCE POWER TO ABATE INTERSTATE AND INTRASTATE POLLUTION,
W70-00771 05G

INTERSTATE COOPERATION IN RIVER BASIN DEVELOPMENT,
W70-00784 06B

CONSTITUTIONAL LAW-NAVIGABLE WATERS-EXTENSION OF THE FEDERAL PREROGATIVE,
W70-00801 04A

FEDERAL PROJECT POLICY
CURRENT LEGISLATION,
W70-00776 06E

FEDERAL-STATE WATER RIGHTS CONFLICT
MAKING THE STATE AN EFFECTIVE PARTNER IN WATER DEVELOPMENT,
W70-00513 06B

FEDERAL-STATE WATER RIGHTS CONFLICTS
FEDERAL ENCROACHMENT ON STATE WATER RIGHTS,
W70-00549 06E

CONSTITUTIONAL LAW-NAVIGABLE WATERS-EXTENSION OF THE FEDERAL PREROGATIVE,
W70-00801 04A

FERRIES
CERTAIN FERRIES OPERATED BY CONNECTICUT.
W70-00808 06E

FERTILIZERS
EFFECTS OF FERTILIZERS ON WATER QUALITY.
W70-00717 05C

FIBER CONTENT
PHYSICAL PROPERTIES OF PEATS AS RELATED TO DEGREE OF DECOMPOSITION,
W70-00761 02G

FIELD PROTRACTOR
MEASURING ANGLES WITH A CARPENTER'S FOLDING RULER,
W70-00760 07B

FILTRATION
DEPOSITION OF CLASTIC SEDIMENTS BY CLAMS,
W70-00442 02J

DETERMINATION OF DEPENDENCE BETWEEN FILTRATION CHARACTERISTICS OF DRAINAGE CANALS (IN RUSSIAN),
W70-00663 04A

FINANCING
CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

DRAINAGE DISTRICTS UNDER 1911 ACT.
W70-00715 04A

FIRM SIZE
COST OF CAPITAL TO THE SMALL FIRM,
W70-00616 06C

FISH
FISH AND GAME.
W70-00588 06E

W70-00593 06E

FISH NOT TO BE KILLED OR TAKEN BY EXPLOSIVES.
W70-00831 06E

FISH BARRIERS
FISH AND GAME.
W70-00593 06E

FISH CONSERVATION
POWERS AND DUTIES OF THE DIRECTOR OF THE DIVISION OF FISH AND GAME AND OF GAME WARDENS.
W70-00431 06E

NETS AND SEINES, STURGEON, SHAD, AND HERRING SEASON.
W70-00585 06E

FISH AND GAME.
W70-00593 06E

FISH NOT TO BE KILLED OR TAKEN BY EXPLOSIVES.
W70-00831 06E

FISH MANAGEMENT
POTOMAC RIVER COMPACT OF 1958.
W70-00810 06E

FISHERIES
POTOMAC RIVER COMPACT OF 1958.
W70-00810 06E

FISHES
PESTICIDES AND FISHES--A REVIEW OF SELECTED LITERATURE,
W70-00718 05C

FISHING
LICENSES NETS, SEINES, AND TRAPS.
W70-00432 06E

REAL PROPERTY--WATER RIGHTS--PUBLIC RIGHTS OF FISHING AND NAVIGATION OVER FLOODED LANDS.
W70-00575 04A

BROWN V BOWLES (OFFSHORE FISHING RIGHTS).
W70-00589 06E

HUNTING AND FISHING LICENSES.
W70-00807 06E

FISHING SEASONS
NETS AND SEINES, STURGEON, SHAD, AND HERRING SEASON.
W70-00585 06E

FLOOD CONTROL
ECONOMIC ANALYSIS OF ALTERNATIVE FLOOD CONTROL MEASURES BY DIGITAL COMPUTER,
W70-00617 06A

THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

FLOOD CONTROL POLICY AND FLOOD MANAGEMENT,
W70-00728 06F

OPTIMUM INESTMENT IN STRUCTURAL FLOOD CONTROL,
W70-00729 06B

COORDINATION OF URBAN PLANNING AND FLOOD PLAIN DEVELOPMENT,
W70-00751 06B

THE INTERACTION OF URBAN REDEVELOPMENT AND FLOOD PLAIN MANAGEMENT IN WATERLOO, IOWA,
W70-00752 06B

FLOOD CONTROL ACT.
W70-00827 04A

W70-00828 04A

W70-00829 04A

FLOOD DAMAGE
DRAINAGE OF WATER FROM PUBLIC ROADS AND REPAIR OF FLOOD DAMAGE TO CERTAIN ROADS.
W70-00832 06E

FLOOD DAMAGES
THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

FLOOD LOSS ESTIMATION
THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

FLOOD LOSSES
THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

FLOOD PLAIN INSURANCE
FLOOD CONTROL POLICY AND FLOOD MANAGEMENT,
W70-00728 06F

FLOOD PLAIN MANAGEMENT
FLOOD CONTROL POLICY AND FLOOD MANAGEMENT,
W70-00728 06F

THE INTERACTION OF URBAN REDEVELOPMENT AND FLOOD PLAIN MANAGEMENT IN WATERLOO, IOWA,
W70-00752 06B

FLOOD PLAIN ZONING
FLOOD CONTROL POLICY AND FLOOD MANAGEMENT,

W70-00728 06F

OPTIMUM INESTMENT IN STRUCTURAL FLOOD CONTROL,
W70-00729 06B

FLOOD PROTECTION
THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

FLOODWATERS
REAL PROPERTY--WATER RIGHTS--PUBLIC RIGHTS OF FISHING AND NAVIGATION OVER FLOODED LANDS.
W70-00575 04A

FLORIDA
WATER LAW AND ADMINISTRATION - THE FLORIDA EXPERIENCE,
W70-00527 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 1 INTRODUCTION,
W70-00528 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 2 RIGHTS IN DEFINED WATERBODIES BASIC CONSIDERATIONS,
W70-00529 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 3 OWNERSHIP OF UPLAND AS THE SOURCE OF RIPARIAN RIGHTS,
W70-00530 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 4 NONCONSUMPTIVE USES OF NATURAL NAVIGABLE WATERBODIES,
W70-00531 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 5 CONSUMPTIVE USE OF WATER COMMON LAW RULES,
W70-00532 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 6 STATUTORY MODIFICATIONS OF EASTERN CONSUMPTIVE USE DOCTRINES,
W70-00533 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 7 RIGHTS IN DISPOSAL OF DIFFUSED SURFACE WATER,
W70-00534 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 8 FEDERAL AUTHORITY AND ACTIVITY AFFECTING FLORIDA'S WATER RESOURCES,
W70-00535 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 9 STATE ADMINISTRATION OF WATER RESOURCES IN FLORIDA,
W70-00536 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 10 SINGLE PURPOSE AND MULTIPURPOSE WATER MANAGEMENT DISTRICTS,
W70-00537 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 11 THE LAW AND ADMINISTRATION OF POLLUTION CONTROL IN FLORIDA,
W70-00538 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 12 TITLE TO BEDS UNDER NAVIGABLE WATERS,
W70-00539 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 13 A LOOK TO THE FUTURE,
W70-00540 04A

RIPARIAN RIGHTS IN FLORIDA,
W70-00555 06E

W70-00556 06E

W70-00557 06E

W70-00558 06E

LAWS OF FLORIDA GOVERNING WATER USE,
W70-00769 06D

FLOW
FORCES ACTING UPON THE SOLID PHASE OF A POROUS MEDIUM,
W70-00459 02G

FLOW CHARACTERISTICS
AN EXPERIMENTAL RESEARCH OF COEFFICIENT OF LONGITUDINAL DISPERSION FOR SMALL RIVERS (IN RUSSIAN),
W70-00743 05B

FLOW MEASUREMENT
STAGE-DISCHARGE CHARACTERISTICS OF A WEIR IN A SAND-CHANNEL STREAM,
W70-00418 02E

FLOWAGE EASEMENTS
DEPARTMENT OF CONSERVATION.
W70-00583 04C

COMPENSATION FOR TAKING OF FLOWAGE EASEMENTS BY CONDEMNATION,
W70-00781 04A

WATERS AND WATERCOURSES - EASEMENTS - IMPLIED DEDICATION OF FLOWAGE EASEMENT APPURTENANT TO A DAM,
W70-00802 04A

FLUID MECHANICS
FLUID DYNAMICS OF MULTIPHASE SYSTEMS,
W70-00469 02F

FOOD PRODUCTION
MICRO-IRRIGATION BY CATCHMENT TANK,
W70-00701 03B

FOODS
PROBLEMS OF QUALITY AND QUANTITY IN THE MANAGEMENT OF THE LIVING RESOURCES OF THE SEA,
W70-00608 06G

FORECASTING
ANTICIPATING THE NATIONS NEED FOR ECONOMIC KNOWLEDGE,
W70-00620 6B

OUTDOOR RECREATION,
W70-00623 06B

APPLICATION OF THE SPECTRAL ANALYSIS METHOD TO THE PRE-ESTIMATION OF TIDES (IN RUSSIAN),
W70-00643 02L

FOREST
THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
W70-00765 02I

FOREST CUTTING PATTERNS
SNOWPACK MANAGEMENT,
W70-00763 02C

FORESTRY
SNOWPACK MANAGEMENT,
W70-00763 02C

FORESTS
DUTIES OF MINNESOTA LAND EXCHANGE COMMISSION.
W70-00584 06E

FORM OF CONTRACT
COST ALLOCATION IN RELATION TO WESTERN WATER POLICIES,
W70-00633 06C

FRESH WATER
REMOVAL OF VEGETATION FROM WATERCOURSES.
W70-00437 04A

FUNGI
SEWAGE FUNGUS ITS NATURE AND EFFECTS,
W70-00637 05C

FUTURE PLANNING(PROJECTED)
THE WATER RESOURCES OF CHILE AN ECONOMIC METHOD FOR ANALYZING A KEY RESOURCE IN A NATION'S DEVELOPMENT,
W70-00699 06B

GAGING STATIONS
STAGE-DISCHARGE CHARACTERISTICS OF A WEIR IN A SAND-CHANNEL STREAM,
W70-00418 02E

GARDENS
MICRO-IRRIGATION BY CATCHMENT TANK,
W70-00701 03B

GAS CHROMATOGRAPHY
DETERMINATION OF PHENOXY ACID HERBICIDES IN WATER BY ELECTRON-CAPTURE AND MICROCOULOMETRIC GAS CHROMATOGRAPHY,
W70-00473 05A

GEOCHEMICAL PROSPECTING
THE USE OF RADON-222 IN SURFACE WATERS IN GEOCHEMICAL PROSPECTING FOR URANIUM,
W70-00421 02J

INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
W70-00422 02J

URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
W70-00424 02H

GEOCHEMISTRY
INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
W70-00422 02J

ON THE GEOCHEMISTRY OF UPPER PALEOZOIC AND LOWER MESOZOIC SEDIMENTS OF THE NORTHERN PART OF THE CISVERKHOYANSK TROUGH (RUSSIAN),
W70-00429 02K

THE APPEARANCE AND ORIGIN OF COLOURS IN MUDDY MARINE SEDIMENTS AROUND NEW ZEALAND,
W70-00661 02L

GEOGRAPHY OF DEMAND
SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

GEOMORPHOLOGY
GEOMORPHOLOGY OF A SAND RIDGE,
W70-00453 02J

DIFFERENTIAL EQUATION OF THE EVOLUTION OF DELUVIAL SLOPES (IN RUSSIAN),
W70-00648 02J

AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN LANDSCAPE-GEOMORPHOLOGICAL FACTORS AND SEDIMENT RUNOFF OF THE RIVERS OF THE WESTERN TRANSCAUCASUS (IN RUSSIAN),
W70-00656 02J

GEOPHYSICAL EXPLORATION
ANNUAL REPORT 1968-1969.
W70-00764 09D

GEORGIA SSR
SOME CHARACTERISTICS OF THE WATERS OF GEORGIAN MUD VOLCANOES (IN RUSSIAN),
W70-00670 02K

GLACIAL DRIFT
GEOLOGY OF THE REGOLITH AQUIFERS OF THE NISHNABOTNA BASIN,
W70-00458 02F

GLACIERS
THE EXCHANGE OF HYDROGEN ISOTOPES BETWEEN ICE AND WATER IN TEMPERATURE GLACIERS,
W70-00439 02K

THREE-DIMENSIONAL SURGES AND RECOVERIES IN A NUMERICAL GLACIER MODEL,
W70-00443 02C

GOALS AND OBJECTIVES
WATER QUALITY OBJECTIVES,
W70-00506 06B

GOLD
NATURAL ORGANIC ACIDS IN THE TRANSPORTATION, DEPOSITION, AND CONCENTRATION OF GOLD,
W70-00425 02K

GOVERNMENT
EFFICIENCY IN GOVERNMENT SPENDING,
W70-00615 06B

MEASURING BENEFITS OF GOVERNMENT INVESTMENTS.
W70-00622 06B

GOVERNMENTS
INSTITUTIONAL FACTORS AND THE TEXAS WATER PLAN,
W70-00492 06B

GRAYS HARBOR(WASH)
ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
W70-00419 02L

GREAT LAKES
WATER-RELATED RESEARCH FOR THE GREAT LAKES REGION,
W70-00433 02H

THE ROLE OF MARINE SCIENCES IN THE MULTIPLE USES OF THE COASTAL ZONE OF LAKE ERIE AND LAKE SUPERIOR,
W70-00457 02L

LITTORAL RIGHTS ON THE GREAT LAKES,
W70-00574 06E

GREAT LAKES BASIN COMPACT.
W70-00592 06E

INDIANA DEEP WATERWAYS COMMISSION.
W70-00596 04A

ECOLOGICAL FACTORS AND THE DISTRIBUTION OF CLADOPHORA GLOMERATA IN THE GREAT LAKES,
W70-00667 05C

GREAT LAKES REGION
WATER-RELATED RESEARCH FOR THE GREAT LAKES REGION,
W70-00433 02H

GREAT PLAINS
ADVECTIVE CONTRIBUTION OF ENERGY UTILIZED IN EVAPOTRANSPIRATION BY ALFALFA IN THE EAST CENTRAL GREAT PLAINS (U.S.A.),
W70-00690 02D

GREAT PONDS
THE GREAT POND ORDINANCE--COLLECTIVISM IN NORTHERN NEW ENGLAND,
W70-00522 06E

GROUND WATER
DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00544 05G

GROUNDWATER
WATER RESOURCES OF RANDOLPH AND LAWRENCE COUNTIES, ARKANSAS,
W70-00420 02E

GROUND-WATER CONDITIONS IN MCMULLEN VALLEY, MARICOPA, YUMA AND YAVAPAI COUNTIES, ARIZONA,
W70-00426 02F

OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
W70-00428 02K

LIMESTONE HYDROLOGY IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
W70-00451 02F

RESULTS OF SUBSURFACE EXPLORATION IN THE MID-ISLAND AREA OF WESTERN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
W70-00455 02F

GROUNDWATER RESOURCES OF MONMOUTH COUNTY, NEW JERSEY,
W70-00465 02F

GROUNDWATER RECONNAISSANCE IN THE BURNT RIVER VALLEY AREA, OREGON,
W70-00468 02F

AVAILABILITY OF GROUND WATER IN YORK COUNTY, NEBRASKA,
W70-00472 02F

HYDROLOGIC DATA FOR THE OAK RIDGE AREA, TENNESSEE,
W70-00476 02E

GROUNDWATER RESOURCES OF THE PASCAGOULA RIVER BASIN, MISSISSIPPI AND ALABAMA,
W70-00477 02F

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 5 CONSUMPTIVE USE OF WATER COMMON LAW RULES,
W70-00532 06E

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00542 05G

W70-00543 05G

GROUNDWATER RESOURCES OF THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00687 02F

CHEMICAL QUALITY OF STREAMS IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00688 02K

WATER SUPPLY, USE AND MANAGEMENT,
W70-00706 04B

CURRENT DEVELOPMENTS IN GROUND WATER LAW.
W70-00774 04B

GROUNDWATER MOVEMENT
OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
W70-00428 02K

AN INEXPENSIVE METHOD FOR DETERMINING THE DIRECTION OF NATURAL FLOW OF GROUNDWATER,
W70-00635 02F

GROUNDWATER POLLUTION
ANNUAL REPORT 1968-1969.
W70-00764 09D

GROWTH RATES
PRESSURES OF GROWTH UPON ENVIRONMENT,
W70-00618 06G

GULF OF CALIFORNIA
POWER, WATER AND FOOD FOR DESERT COASTS AN INTEGRATED SYSTEM FOR PROVIDING THEM,
W70-00694 03A

HARBOR IMPROVEMENT
COMMISSIONERS OF STEAMSHIP TERMINALS.
W70-00809 06E

HARBORS
INDIANA BOARD OF PUBLIC HARBORS AND TERMINALS.
W70-00591 06E

HAWAII
HYDROGRAPH STUDY AND PEAK DISCHARGE DETERMINATION OF HAWAIIAN SMALL WATERSHEDS ISLAND OF OAHU,
W70-00449 02A

ANNUAL REPORT 1968-1969.
W70-00764 09D

HEAT BALANCE
COMPUTATION OF THE COMPONENTS OF THE THERMAL BALANCE OF PLANNED RESERVOIRS,
W70-00744 02D

HEOD
ACCUMULATION OF DIELDRIN BY FISH AND SELECTED FISH-FOOD ORGANISMS,
W70-00714 05C

HERBICIDES
DETERMINATION OF PHENOXY ACID HERBICIDES IN WATER BY ELECTRON-CAPTURE AND MICROCOULOMETRIC GAS CHROMATOGRAPHY,
W70-00473 05A

HIGH RESOLUTION MASS SPECTROMETRY
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

HIGH WATER MARK
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 3 OWNERSHIP OF UPLAND AS THE SOURCE OF RIPARIAN RIGHTS,
W70-00530 06E

SHOREFRONT PARK IMPROVEMENT ASSOCIATION, INC V KING (RIPARIAN RIGHTS AND RESTRICTIONS ON THE RIPARIAN LAND).
W70-00812 06E

HIGHWAYS
DRAINAGE OF WATER FROM PUBLIC ROADS AND REPAIR OF FLOOD

HIG-INS

DAMAGE TO CERTAIN ROADS.
W70-00832 06E

HISTORY
THE GREAT POND ORDINANCE--COLLECTIVISM IN NORTHERN NEW ENGLAND,
W70-00522 06E

HISTOSOLS
PHYSICAL PROPERTIES OF PEATS AS RELATED TO DEGREE OF DECOMPOSITION,
W70-00761 02G

HOME ENVIRONMENT
ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
W70-00730 05G

HYDRAULIC CONDUCTIVITY
PHYSICAL PROPERTIES OF PEATS AS RELATED TO DEGREE OF DECOMPOSITION,
W70-00761 02G

HYDROELECTRIC FRANCHISES
CONSTITUTIONAL LAW-NAVIGABLE WATERS-EXTENSION OF THE FEDERAL PREROGATIVE,
W70-00801 04A

HYDROELECTRIC PLANTS
CASTAWAYS MOTEL V SCHUYLER (PERMISSION TO BUILD A BULKHEAD).
W70-00735 06E

HYDROELECTRIC POWER
PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.
W70-00508 06E

HYDROGEOLOGY
HYDROLOGY OF CARBONATE ROCK TERRANES, A REVIEW-WITH SPECIAL REFERENCE TO THE UNITED STATES (PART 1),
W70-00454 02F

GEOLOGY OF THE REGOLITH AQUIFERS OF THE NISHNABOTNA BASIN,
W70-00458 02F

ANNUAL REPORT 1968-1969.
W70-00764 09D

HYDROGRAPH ANALYSIS
HYDROGRAPH STUDY AND PEAK DISCHARGE DETERMINATION OF HAWAIIAN SMALL WATERSHEDS ISLAND OF OAHU,
W70-00449 02A

HYDROLOGIC BUDGET
SURFACE-WATER RESOURCES OF THE YOBE RIVER SYSTEM, NORTHERN NIGERIA, 1963-68,
W70-00456 02A

GEOLOGY OF THE REGOLITH AQUIFERS OF THE NISHNABOTNA BASIN,
W70-00458 02F

HYDROLOGIC DATA
THE USE OF EXPONENTIAL FUNCTIONS WHEN CONSTRUCTING THE LAWS OF THE DISTRIBUTION OF GEOGRAPHICAL AND HYDROMETEOROLOGICAL PARAMETERS (IN RUSSIAN),
W70-00657 02A

SURFACE WATER IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00689 02E

HYDROLOGIC PROPERTIES
HYDROLOGY OF FROZEN GROUND FLOODS,
W70-00721 02C

ICE BREAKUP
TIDAL FLAT EROSION BY ICE AT LA POCATIERE, ST. LAWRENCE ESTUARY,
W70-00640 02L

ILLINOIS
COST OF MUNICIPAL SEWAGE TREATMENT,
W70-00493 05D

WATER RESOURCE INFORMATION FOR PLANNING AND MANAGEMENT,
W70-00515 06B

THE CHICAGO WATER DIVERSION CONTROVERSY,
W70-00554 04D

WATER--AS A SPECIES OF PRIVATE PROPERTY--THE ILLINOIS VIEW,
W70-00568 04A

ILLINOIS DRAINAGE CODE.
W70-00737 06E

CANALS AND WATERWAYS.
W70-00814 04A

ILLINOIS DRAINAGE LAW (A COMMENTARY),
W70-00815 04A

PUBLIC UTILITIES (PUBLIC WATER DISTRICTS).
W70-00816 06E

ILLINOIS STATE GEOLOGICAL SURVEY
WATER RESOURCE INFORMATION FOR PLANNING AND MANAGEMENT,
W70-00515 06B

IMPERVIOUS MEMBRANES
MICRO-IRRIGATION BY CATCHMENT TANK,
W70-00701 03B

IMPLIED DEDICATION
WATERS AND WATERCOURSES - EASEMENTS - IMPLIED DEDICATION OF FLOWAGE EASEMENT APPURTENANT TO A DAM,
W70-00802 04A

IMPOUNDED WATERS
WATERS AND WATERCOURSES - EASEMENTS - IMPLIED DEDICATION OF FLOWAGE EASEMENT APPURTENANT TO A DAM,
W70-00802 04A

INCREMENTAL COSTS
PRODUCTION COST FACTOR IN RATE-MAKING,
W70-00602 06C

INDIA
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

INDIANA
POWERS AND DUTIES OF THE DIRECTOR OF THE DIVISION OF FISH AND GAME AND OF GAME WARDENS.
W70-00431 06E

LICENSES NETS, SEINES, AND TRAPS.
W70-00432 06E

REMOVAL OF VEGETATION FROM WATERCOURSES.
W70-00437 04A

LEVEES.
W70-00485 04A

KANKAKEE LANDS.
W70-00517 06E

POLLUTION OF WATERS OF STATE.
W70-00578 05G

POLLUTION OF WATERS OF THE STATE THE STREAM POLLUTION CONTROL BOARD OF THE STATE OF INDIANA.
W70-00579 05G

POLLUTION OF WATERS OF STATE.
W70-00580 05G

W70-00581 06E

INDIANA BOARD OF PUBLIC HARBORS AND TERMINALS.
W70-00591 06E

GREAT LAKES BASIN COMPACT.
W70-00592 06E

FISH AND GAME.
W70-00593 06E

DRAINAGE MAINTENANCE AND REPAIR DISTRICTS.
W70-00594 04A

DRAINS RIGHT-OF-WAYS--OBSTRUCTIONS--CROSSINGS--CONNECTIONS.
W70-00595 04A

INDIANA DEEP WATERWAYS COMMISSION.
W70-00596 04A

OHIO RIVER VALLEY WATER SANITATION COMPACT.
W70-00826 05G

FLOOD CONTROL ACT.
W70-00827 04A

W70-00828 04A

W70-00829 04A

INTERSTATE DRAINS.
W70-00830 04A

INDUSTRIAL SAFETY
CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

INDUSTRIAL WASTES
NEUTRALIZATION OF ACID MINE DRAINAGE,
W70-00662 05D

MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,
W70-00682 05B

INJECTION WELLS
REDUCING LAND SUBSIDENCE IN THE WILMINGTON OIL FIELD BY THE USE OF SALINE WATERS,
W70-00447 05G

INPUT-OUTPUT ANALYSIS
STRUCTURE OF THE ARIZONA ECONOMY OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
W70-00697 06B

INSTRUMENTATION
A DIVERSIFIED PROGRAM FOR THE STUDY OF SHALLOW WATER SEARCHING AND MAPPING TECHNIQUES,
W70-00461 07B

AN EXPERIMENTAL IN SITU DENSITOMETER,
W70-00462 07B

SNOWY RANGE WATER RESOURCE OBSERVATORY (A PROGRESS REPORT).

W70-00480 07C

OPTICAL METHOD FOR DETERMINING PARTICLE SIZES OF COARSE SEDIMENT,
W70-00655 02J

HYDROLOGICAL REQUIREMENTS FOR WEATHER RADAR DATA,
W70-00673 02B

APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
W70-00679 04A

INSURANCE
CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

OIL POLLUTION OF THE SEA THE EFFORTS OF THE OIL AND SHIPPING INDUSTRIES.
W70-00794 05G

INTANGIBLE BENEFITS
COST-BENEFIT ANALYSIS SELECTED ISSUES,
W70-00487 05G

ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
W70-00730 05G

INTANGIBLE COSTS
COST-BENEFIT ANALYSIS SELECTED ISSUES,
W70-00487 05G

INTENT
SHOREFRONT PARK IMPROVEMENT ASSOCIATION, INC V KING (RIPARIAN RIGHTS AND RESTRICTIONS ON THE RIPARIAN LAND).
W70-00812 06E

INTEREST GROUPS
SOCIAL PROBLEMS NEEDING SOLUTIONS, STATE AGENCIES,
W70-00758 06B

INTERNATIONAL COMMISSIONS
OIL POLLUTION OF THE SEA THE INTERNATIONAL RESPONSE.
W70-00790 05G

OIL POLLUTION OF THE SEA THE INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION.
W70-00791 05G

INTERNATIONAL HYDROLOGICAL DECADE
THE UNITED NATIONS AND MARINE RESOURCES,
W70-00783 06B

INTERNATIONAL LAW
THE TERRITORIAL SEA A QUEST FOR UNIFORMITY,
W70-00519 06E

SEDENTARY FISHERIES AND ARTICLE 2(4) OF THE CONVENTION ON THE CONTINENTAL SHELF - A PLEA FOR A SEPARATE REGIME,
W70-00772 06E

THE UNITED NATIONS AND MARINE RESOURCES,
W70-00783 06B

INTERNATIONAL WATERS
UNITED STATES RIVER TREATIES,
W70-00518 06E

THE TERRITORIAL SEA A QUEST FOR UNIFORMITY,
W70-00519 06E

THE UNITED NATIONS AND MARINE RESOURCES,
W70-00783 06B

OIL POLLUTION OF THE SEA.
W70-00786 05G

INTERSTATE
CONCURRENT JURISDICTION OF A NAVIGABLE BOUNDARY RIVER.
W70-00524 06E

INTERSTATE COOPERATION IN RIVER BASIN DEVELOPMENT,
W70-00784 06B

INTERSTATE COMMERCE
FEDERAL AIR AND WATER CONTROL THE APPLICATION OF THE COMMERCE POWER TO ABATE INTERSTATE AND INTRASTATE POLLUTION,
W70-00771 05G

INTERSTATE COMMISSIONS
GREAT LAKES BASIN COMPACT.
W70-00592 06E

OHIO RIVER VALLEY WATER SANITATION COMPACT.
W70-00826 05G

INTERSTATE DRAINS.
W70-00830 04A

INTERSTATE COMPACTS
BROWN V BOWLES (OFFSHORE FISHING RIGHTS).
W70-00589 06E

GREAT LAKES BASIN COMPACT.
W70-00592 06E

RIVER AND HARBOR IMPROVEMENTS.
W70-00696 04A

POTOMAC RIVER COMPACT OF 1958.
W70-00810 06E

STREAM POLLUTION.
W70-00835 05G

INTERSTATE COOPERATION
INTERSTATE COOPERATION IN RIVER BASIN DEVELOPMENT,
W70-00784 06B

INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION
OIL POLLUTION OF THE SEA THE INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION.
W70-00791 05G

INVESTIGATIONS
WEST CENTRAL MISSISSIPPI WATERWAY COMMISSION.
W70-00738 06E

INVESTMENT
TAXATION AND THE DISPOSITION OF DEPRECIABLE ASSETS,
W70-00600 06C

PLANT SIZING FOR A SEASONAL PRODUCT DEMAND USING A LINEAR PROGRAMMING MODEL,
W70-00604 06A

INVESTMENTS
MEASURING BENEFITS OF GOVERNMENT INVESTMENTS.
W70-00622 06B

IONS
A NOTE ON THE DEPENDENCE BETWEEN THE CONCENTRATION OF CHLORIDE IONS AND THE RADIOACTIVITY OF EMANATION DISSOLVED IN MINERAL WATERS (IN POLISH),
W70-00668 05A

IOWA
GEOLOGY OF THE REGOLITH AQUIFERS OF THE NISHNABOTNA BASIN,
W70-00458 02F

FISHING AND RECREATIONAL RIGHTS IN IOWA STREAMS AND LAKES.
W70-00550 06E

W70-00551 06E

W70-00552 06E

W70-00553 06E

DETERMINATION OF RIGHTS TO REAL PROPERTY ALONG THE MISSOURI RIVER IN CONNECTION WITH RIVER STABILIZATION,
W70-00572 04A

IOWA WATER LAW PROBLEMS TO BE CONSIDERED.
W70-00573 06E

OPERATION AND EQUIPMENT OF VESSELS.
W70-00586 06E

WATER NAVIGATION REGULATIONS.
W70-00587 06E

ISLANDS AND ABANDONED RIVER CHANNELS.
W70-00817 04A

IRAN
THE QANATS OF IRAN,
W70-00692 04B

IRRIGATED LAND
NOTES ON PROBLEMS OF IRRIGATION IN THREE LIBYAN OASES,
W70-00703 04B

IRRIGATION
IRRIGATION IN KENTUCKY AS AFFECTED BY THE LAW OF RIPARIAN RIGHTS,
W70-00571 03F

REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
W70-00627 03F

AGRICULTURAL METEOROLOGY IN ISRAEL,
W70-00691 03F

MICRO-IRRIGATION BY CATCHMENT TANK,
W70-00701 03B

IRRIGATION CANALS
IRRIGATION IN THE AMU-DAR'YA BASIN PROGRESS REPORT,
W70-00705 03F

IRRIGATION DESIGN
SPRINKLER IRRIGATION,
W70-00695 03F

IRRIGATION PRACTICES
NOTES ON PROBLEMS OF IRRIGATION IN THREE LIBYAN OASES,
W70-00703 04B

IRRIGATION SYSTEMS
IRRIGATION IN THE AMU-DAR'YA BASIN PROGRESS REPORT,
W70-00705 03F

ISLANDS
ISLANDS AND ABANDONED RIVER CHANNELS.
W70-00817 04A

ISOLATION
THE ISOLATION, PURIFICATION, AND NUTRIENT SOLUTION REQUIREMENTS OF BLUE-GREEN ALGAE,
W70-00719 05C

ISRAEL
AGRICULTURAL METEOROLOGY IN ISRAEL,
W70-00691 03F

JOINT COSTS
COST ALLOCATION IN RELATION TO WESTERN WATER POLICIES,
W70-00633 06C

JUDICIAL DECISIONS
RIPARIAN RIGHTS IN ARTIFICIAL LAKES AND STREAMS,
W70-00797 04A

JUDICIAL REVIEW
APPEAL TO WATER RESOURCES BOARD.
W70-00734 06E

JURISDICTION
INSTITUTIONAL FACTORS AND THE TEXAS WATER PLAN,
W70-00492 06B

CONCURRENT JURISDICTION OF A NAVIGABLE BOUNDARY RIVER.
W70-00524 06E

KARST
LIMESTONE HYDROLOGY IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
W70-00451 02F

HYDROLOGY OF CARBONATE ROCK TERRANES, A REVIEW-WITH SPECIAL REFERENCE TO THE UNITED STATES (PART 1),
W70-00454 02F

WATER BUDGET STUDIES IN KARST AQUIFERS,
W70-00676 02F

KENTUCKY
COMPENSATION FOR THE RIGHT OF ACCESS TO NAVIGABLE WATERS,
W70-00566 04A

WATER BOUNDARIES,
W70-00570 04A

IRRIGATION IN KENTUCKY AS AFFECTED BY THE LAW OF RIPARIAN RIGHTS,
W70-00571 03F

PROVISIONS AS TO DITCHES, DRAINAGE, AND RECLAMATION.
W70-00590 04A

LEVEES.
W70-00818 04A

W70-00819 04A

W70-00820 06E

DRAINAGE AND RECLAMATION ACT OF 1912.
W70-00821 04A

W70-00822 04A

W70-00823 04A

W70-00824 04A

W70-00825 04A

LABORATORY TESTS
ACCUMULATION OF DIELDRIN BY FISH AND SELECTED FISH-FOOD ORGANISMS,
W70-00714 05C

LAKE SOILS
VERTICAL DISTRIBUTION OF PHOSPHORUS IN LINSLEY POND MUD,
W70-00712 02H

LAKE TAHOE(CALIF-NEV)
OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
W70-00711 02H

LAKES
AN ORIENTATION STUDY OF THE URANIUM DISTRIBUTION IN LAKE WATERS, BEAVERLODGE DISTRICT, SASKATCHEWAN,
W70-00423 02H

URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
W70-00424 02H

APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
W70-00636 07B

COMPARATIVE ECOLOGY OF SANDSPIT PONDS,
W70-00671 02L

OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
W70-00711 02H

LAND DEVELOPMENT
DUTIES OF MINNESOTA LAND EXCHANGE COMMISSION.
W70-00584 06E

LAND MANAGEMENT
ENGINEERING PHASES OF LAND TREATMENT RELATED TO INCREASING WATER-USE EFFICIENCY AND STORAGE EFFICIENCY RAINFALL,
W70-00448 04A

LAND RECLAMATION
PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.
W70-00496 06E

LAND TENURE
ESTUARINE LAND OF NORTH CAROLINA LEGAL ASPECTS OF OWNERSHIP, USE, AND CONTROL,
W70-00565 06E

REAL PROPERTY--WATER RIGHTS--PUBLIC RIGHTS OF FISHING AND NAVIGATION OVER FLOODED LANDS.
W70-00575 04A

TIDELANDS IN SOUTH CAROLINA A STUDY IN THE LAW OF REAL PROPERTY,
W70-00782 06E

LAND USE
LAND USE ALONG A TROPICAL CLIMATIC BOUNDARY THE WALAWE GANGA BASIN OF CEYLON,
W70-00463 03B

IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
W70-00627 03F

LANDSCAPE WILDERNESS
RESOURCE QUALITY AND VALUE OF THE LANDSCAPE,
W70-00607 06G

LANDSLIDES
EARTHFLOW OCCURRENCE DURING HIGH INTENSITY RAINFALL IN EASTERN OTAGO (NEW ZEALAND),
W70-00647 02B

LAW OF THE SEA
THE TERRITORIAL SEA A QUEST FOR UNIFORMITY,
W70-00519 06E

LEACHING
NITROGEN CONTAMINATION OF GROUNDWATER BY BARNYARD LEACHATES,
W70-00665 05B

LEASES
STATUTES-EXTENT OF THE AUTHORITY OF THE DEPARTMENT OF CONSERVATION.
W70-00800 04A

LEGAL ASPECTS
UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA,
W70-00430 05G

THE CHICAGO WATER DIVERSION CONTROVERSY,
W70-00554 04D

CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

LEGISLATION
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE
CHAPTER 12 TITLE TO BEDS UNDER NAVIGABLE WATERS,
W70-00539 06E

FEDERAL ENCROACHMENT ON STATE WATER RIGHTS,
W70-00549 06E

APPEAL TO WATER RESOURCES BOARD.
W70-00734 06E

THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
W70-00766 05G

FEDERAL AIR AND WATER CONTROL THE APPLICATION OF THE COMMERCE POWER TO ABATE INTERSTATE AND INTRASTATE POLLUTION,
W70-00771 05G

CURRENT DEVELOPMENTS IN GROUND WATER LAW.
W70-00774 04B

CURRENT LEGISLATION,
W70-00776 06E

OIL POLLUTION OF THE SEA UNITED STATES ACTION.
W70-00792 05G

STATUTES-EXTENT OF THE AUTHORITY OF THE DEPARTMENT OF CONSERVATION.
W70-00800 04A

LEVEES
LEVEES.
W70-00485 04A

THE APPROPRIATION OF PROPERTY FOR LEVEES A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
W70-00562 04A

W70-00563 04A

W70-00564 04A

ILLINOIS DRAINAGE CODE.
W70-00737 06E

LEVEES.
W70-00818 04A

W70-00819 04A

W70-00820 06E

LIGNIN DEGRADATION
BIOCHEMICAL OXYGEN DEMAND AND DEGRADATION OF LIGNIN IN NATURAL WATERS,
W70-00681 05B

LIGNINS
BIOCHEMICAL OXYGEN DEMAND AND DEGRADATION OF LIGNIN IN NATURAL WATERS,
W70-00681 05B

LIMESTONES
HYDROLOGY OF SOUTH BONAIRE, N. A. - A ROCK SELECTIVE DOLOMITIZATION MODEL,
W70-00441 02F

WATER BUDGET STUDIES IN KARST AQUIFERS,
W70-00676 02F

LIMNOLOGY
A LIMNOLOGICAL STUDY OF A TENNESSEE COLD SPRINGBROOK,
W70-00672 02I

LINEAR PROGRAMMING
PLANT SIZING FOR A SEASONAL PRODUCT DEMAND USING A LINEAR PROGRAMMING MODEL,
W70-00604 06A

LINEAR PROGRAMMING MODEL
PLANT SIZING FOR A SEASONAL PRODUCT DEMAND USING A LINEAR PROGRAMMING MODEL,
W70-00604 06A

LINEAR SPACE
ALLOCATION OF RESOURCES AND THE PRICE SYSTEM,
W70-00631 06B

LINSLEY POND(CONN)
VERTICAL DISTRIBUTION OF PHOSPHORUS IN LINSLEY POND MUD,
W70-00712 02H

LITERATURE REVIEW
PESTICIDES AND FISHES--A REVIEW OF SELECTED LITERATURE,
W70-00718 05C

LITTOPAL
LITTORAL RIGHTS ON THE GREAT LAKES,
W70-00574 06E

LITTORAL DRIFT
CALCULATION OF SEDIMENT BALANCE OF THE LITTORAL ZONE (IN RUSSIAN),
W70-00649 02L

LITTORAL RIGHTS
LITTORAL RIGHTS ON THE GREAT LAKES,
W70-00574 06E

LOCAL GOVERNMENTS
PROVISIONS AS TO DITCHES, DRAINAGE, AND RECLAMATION.
W70-00590 04A

COMMISSIONERS OF HEALTH AND DRAINAGE IN CERTAIN COUNTIES.
W70-00788 04A

INTERSTATE DRAINS.
W70-00830 04A

LONG-TERM PLANNING
WATER LAW AND ADMINISTRATION - THE FLORIDA EXPERIENCE,
W70-00527 06E

LOUISIANA
CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
W70-00526 06E

CIVIL LAW PROPERTY--ALLUVION DISTINGUISHING LAKES FROM RIVERS AND STREAMS,
W70-00541 04D

REAL PROPERTY--ALLUVION AND ACCRETION--ARTICLE 509 OF THE LOUISIANA CIVIL CODE,
W70-00560 06E

THE APPROPRIATION OF PROPERTY FOR LEVEES A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
W70-00562 04A

W70-00563 04A

W70-00564 04A

CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
W70-00569 04A

STATUTES-EXTENT OF THE AUTHORITY OF THE DEPARTMENT OF CONSERVATION.
W70-00800 04A

EQUAL FOOTING AND THE MARGINAL SEA,
W70-00804 04A

LOW FLOW
RUNOFF FROM SMALL PEATLAND WATERSHEDS,
W70-00675 02E

LOW WATER MARK
SHOREFRONT PARK IMPROVEMENT ASSOCIATION, INC V KING
(RIPARIAN RIGHTS AND RESTRICTIONS ON THE RIPARIAN LAND).
W70-00812 06E

LUMBERING
SNOWPACK MANAGEMENT,
W70-00763 02C

LYBIA
NOTES ON PROBLEMS OF IRRIGATION IN THREE LIBYAN OASES,
W70-00703 04B

LYSIMETERS
ADVECTIVE CONTRIBUTION OF ENERGY UTILIZED IN EVAPOTRANSPIRATION BY ALFALFA IN THE EAST CENTRAL GREAT PLAINS (U.S.A.),
W70-00690 02D

MAINE
THE GREAT POND ORDINANCE--COLLECTIVISM IN NORTHERN NEW ENGLAND,
W70-00522 06E

MAPPING
A DIVERSIFIED PROGRAM FOR THE STUDY OF SHALLOW WATER SEARCHING AND MAPPING TECHNIQUES,
W70-00461 07B

MARGINAL COSTS
PRODUCTION COST FACTOR IN RATE-MAKING,
W70-00602 06C

MARGINAL SEA
EQUAL FOOTING AND THE MARGINAL SEA,
W70-00804 04A

MARINE BIOLOGY
STATE OWNERSHIP AND SALE OF SEA SHELLS.
W70-00739 06E

MARINE ENVIRONMENT
THE ROLE OF PHYTOPLANKTON IN THE CYCLING OF RADIONUCLIDES IN THE MARINE ENVIRONMENT,
W70-00708 05C

MARINE FISHERIES
SEDENTARY FISHERIES AND ARTICLE 2(4) OF THE CONVENTION ON THE CONTINENTAL SHELF - A PLEA FOR A SEPARATE REGIME,
W70-00772 06E

MARINE GEOLOGY
RECENT SEDIMENTATION AROUND NORTHERNMOST NEW ZEALAND,
W70-00645 02J

ENVIRONMENTALLY SIGNIFICANT SEDIMENTOLOGIC CHARACTERISTICS OF BEACH SANDS,
W70-00650 02L

RELATIONSHIPS BETWEEN GRAIN SIZE, SIZE-SORTING, AND FORESHORE SLOPE ON MIXED SAND-SHINGLE BEACHES,
W70-00651 02L

OFF-SHORE SEDIMENTS, NORTH-WEST NELSON, SOUTH ISLAND, NEW ZEALAND,
W70-00660 02L

THE APPEARANCE AND ORIGIN OF COLOURS IN MUDDY MARINE SEDIMENTS AROUND NEW ZEALAND,
W70-00661 02L

MARKET VALUE
PRESSURES OF GROWTH UPON ENVIRONMENT,
W70-00618 06G

MARYLAND
CONCURRENT JURISDICTION OF A NAVIGABLE BOUNDARY RIVER.
W70-00524 06E

NETS AND SEINES, STURGEON, SHAD, AND HERRING SEASON.
W70-00585 06E

BROWN V BOWLES (OFFSHORE FISHING RIGHTS).
W70-00589 06E

POTOMAC RIVER COMPACT OF 1958.
W70-00810 06E

NATURAL RESOURCES (OYSTERS AND CLAMS).
W70-00811 06E

MASS
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

MASSACHUSETTS
THE GREAT POND ORDINANCE--COLLECTIVISM IN NORTHERN NEW ENGLAND,
W70-00522 06E

MATHEMATICAL MODELS
THREE-DIMENSIONAL SURGES AND RECOVERIES IN A NUMERICAL GLACIER MODEL,
W70-00443 02C

THREE ESSAYS ON THE STATE OF ECONOMIC SCIENCE,
W70-00630 06B

COMPUTER-ORIENTED METHOD OF OPTIMIZING HYDROLOGIC MODEL PARAMETERS,
W70-00642 06A

MATHEMATICAL STUDIES

FORCES ACTING UPON THE SOLID PHASE OF A POROUS MEDIUM,
W70-00459 02G

THREE ESSAYS ON THE STATE OF ECONOMIC SCIENCE,
W70-00630 06B

APPLICATION OF THE SPECTRAL ANALYSIS METHOD TO THE PRE-ESTIMATION OF TIDES (IN RUSSIAN),
W70-00643 02L

DIFFERENTIAL EQUATION OF THE EVOLUTION OF DELUVIAL SLOPES (IN RUSSIAN),
W70-00648 02J

THE USE OF EXPONENTIAL FUNCTIONS WHEN CONSTRUCTING THE LAWS OF THE DISTRIBUTION OF GEOGRAPHICAL AND HYDROMETEOROLOGICAL PARAMETERS (IN RUSSIAN),
W70-00657 02A

APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
W70-00679 04A

MEANDERS
STATISTICAL ANALYSIS OF MEANDERING RIVER GEOMETRY,
W70-00725 02E

MEASUREMENT
OUTDOOR RECREATION,
W70-00623 06B

APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
W70-00636 07B

MEMBRANE PROCESSES
PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
W70-00726 03A

MERIT-WEIGHTED USER DAYS
OUTDOOR RECREATION,
W70-00623 06B

MESOZOIC ERA
ON THE GEOCHEMISTRY OF UPPER PALEOZOIC AND LOWER MESOZOIC SEDIMENTS OF THE NORTHERN PART OF THE CISVERKHOYANSK TROUGH (RUSSIAN),
W70-00429 02K

METALS
INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
W70-00422 02J

METAMORPHIC ROCKS
PORE STUDIES OF HIGHLY INDURATED APPALACHIAN ROCKS,
W70-00659 02F

METEOROLOGICAL DATA
SOME METEOROLOGICAL REQUIREMENTS IN WATERSHED ENGINEERING RESEARCH,
W70-00474 07A

THE USE OF EXPONENTIAL FUNCTIONS WHEN CONSTRUCTING THE LAWS OF THE DISTRIBUTION OF GEOGRAPHICAL AND HYDROMETEOROLOGICAL PARAMETERS (IN RUSSIAN),
W70-00657 02A

METHANE
MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,
W70-00682 05B

METROPOLITAN PLANNING
PLANNING FOR WATER RESOURCE DEVELOPMENT THE FORMULATION OF A STRATEGY,
W70-00512 06B

MICHIGAN
PIERCE V RILEY (UNREASONABLE EXTENSION OF RIPARIAN RIGHTS).
W70-00813 06E

MICROMETEOROLOGY
AGRICULTURAL METEOROLOGY IN ISRAEL,
W70-00691 03F

MICRO-IRRIGATION
MICRO-IRRIGATION BY CATCHMENT TANK,
W70-00701 03B

MILLS
WATER AND WATERCOURSES--RIPARIAN RIGHTS AS APPLIED TO ARTIFICIAL WATERCOURSES,
W70-00523 06E

MINERAL WATER
OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
W70-00428 02K

A NOTE ON THE DEPENDENCE BETWEEN THE CONCENTRATION OF CHLORIDE IONS AND THE RADIOACTIVITY OF EMANATION DISSOLVED IN MINERAL WATERS (IN POLISH),
W70-00668 05A

ECONOMIC EFFECTS OF USING SUBSTANDARD QUALITY WATER IN WEBSTER AND OTHER COMMUNITIES IN SOUTH DAKOTA.
W70-00727 03C

MINERALOGY
THE LAW OF NAVIGABLE STREAMS IN WEST VIRGINIA,
W70-00576 06E

MINNESOTA
UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA,
W70-00430 05G

DEPARTMENT OF CONSERVATION.
W70-00583 04C

DUTIES OF MINNESOTA LAND EXCHANGE COMMISSION.
W70-00584 06E

RUNOFF FROM SMALL PEATLAND WATERSHEDS,
W70-00675 02E

WATERS AND WATERCOURSES - EASEMENTS - IMPLIED DEDICATION OF FLOWAGE EASEMENT APPURTENANT TO A DAM,
W70-00802 04A

MINNESOTA WATER QUALITY
UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA,
W70-00430 05G

MISSISSIPPI
GROUNDWATER RESOURCES OF THE PASCAGOULA RIVER BASIN, MISSISSIPPI AND ALABAMA,
W70-00477 02F

WEST CENTRAL MISSISSIPPI WATERWAY COMMISSION.
W70-00738 06E

STATE OWNERSHIP AND SALE OF SEA SHELLS.
W70-00739 06E

FISH NOT TO BE KILLED OR TAKEN BY EXPLOSIVES.
W70-00831 06E

DRAINAGE OF WATER FROM PUBLIC ROADS AND REPAIR OF FLOOD DAMAGE TO CERTAIN ROADS.
W70-00832 06E

BRIDGES - GENERAL PROVISIONS.
W70-00833 04A

MUSSELS.
W70-00834 06E

STREAM POLLUTION.
W70-00835 05G

MISSOURI
WATER AND WATERCOURSES--RIPARIAN RIGHTS AS APPLIED TO ARTIFICIAL WATERCOURSES,
W70-00523 06E

PROPERTY RIGHTS OF RIPARIAN OWNER IN MISSOURI WITH RESPECT TO OBSTRUCTION OF A NATURAL OR ARTIFICIAL WATERCOURSE,
W70-00525 06E

RIPARIAN RIGHTS IN ARTIFICIAL LAKES AND STREAMS,
W70-00797 04A

MISSOURI RIVER
DETERMINATION OF RIGHTS TO REAL PROPERTY ALONG THE MISSOURI RIVER IN CONNECTION WITH RIVER STABILIZATION,
W70-00572 04A

THE WANDERING MISSOURI RIVER A STUDY IN ACCRETION LAW,
W70-00777 06E

W70-00778 06E

W70-00779 06E

W70-00780 06E

MIXING
DIAGENESIS, CHEMICAL SEDIMENTS, AND THE MIXING OF NATURAL WATERS,
W70-00674 02K

MODEL STUDIES
A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH VALIDITY TESTING OF A COMPARATIVE-PROJECTOR MODEL,
W70-00479 06A

MONITORING
ENVIRONMENTAL SURVEILLANCE AROUND A NUCLEAR FUEL REPROCESSING INSTALLATION, 1965-1967,
W70-00677 05C

A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
W70-00678 05G

MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,
W70-00682 05B

MUD FLATS
ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
W70-00445 02J

TIDAL FLAT EROSION BY ICE AT LA POCATIERE, ST. LAWRENCE ESTUARY,
W70-00640 02L

MUDFLOWS

SOME CHARACTERISTICS OF THE WATERS OF GEORGIAN MUD VOLCANOES (IN RUSSIAN),
W70-00670 02K

MULTIPHASE FLOW
FLUID DYNAMICS OF MULTIPHASE SYSTEMS,
W70-00469 02F

MULTIPLE-PURPOSE PROJECTS
THE ROLE OF MARINE SCIENCES IN THE MULTIPLE USES OF THE COASTAL ZONE OF LAKE ERIE AND LAKE SUPERIOR,
W70-00457 02L

WEST CENTRAL MISSISSIPPI WATERWAY COMMISSION.
W70-00738 06E

THE INTERACTION OF URBAN REDEVELOPMENT AND FLOOD PLAIN MANAGEMENT IN WATERLOO, IOWA,
W70-00752 06B

MULTI-PURPOSE PROJECTS
WATER RESOURCES PLANNING IN AUSTRALIA,
W70-00704 06B

MUNICIPAL WASTES
MUNICIPAL CORPORATIONS-WATERS AND WATERCOURSES-EMINENT DOMAIN-POLLUTION OF WATER AS A 'TAKING' OF PRIVATE PROPERTY,
W70-00520 05G

MUNICIPAL WATER SUPPLY
PRODUCTION COST FACTOR IN RATE-MAKING,
W70-00602 06C

MUSSELS
MUSSELS.
W70-00834 06E

NATIONAL BUREAU
ANTICIPATING THE NATIONS NEED FOR ECONOMIC KNOWLEDGE,
W70-00620 6B

NATURAL DRAFT TOWERS
PERFORMANCE OF NATURAL-DRAUGHT WATER COOLING TOWERS,
W70-00745 05D

NATURAL FLOW DOCTRINE
NORTH CAROLINA AND OTHER ATLANTIC STATES,
W70-00770 06E

NATURAL POLLUTION
DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00544 05G

NATURAL RESOURCES
NATURAL RESOURCES QUALITY AND QUANTITY.
W70-00605 06G

THE ECOSYSTEM AS A CONCEPTUAL TOOL IN THE MANAGEMENT OF NATURAL RESOURCES,
W70-00609 06G

THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
W70-00693 06B

SEDENTARY FISHERIES AND ARTICLE 2(4) OF THE CONVENTION ON THE CONTINENTAL SHELF - A PLEA FOR A SEPARATE REGIME,
W70-00772 06E

NATURAL STREAMS
BIOCHEMICAL OXYGEN DEMAND AND DEGRADATION OF LIGNIN IN NATURAL WATERS,
W70-00681 05B

NAVIGABLE RIVERS
THE LAW OF NAVIGABLE STREAMS IN WEST VIRGINIA,
W70-00576 06E

CONSTITUTIONAL LAW-NAVIGABLE WATERS-EXTENSION OF THE FEDERAL PREROGATIVE,
W70-00801 04A

NAVIGABLE WATERS
CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
W70-00526 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 2 RIGHTS IN DEFINED WATERBODIES BASIC CONSIDERATIONS,
W70-00529 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 12 TITLE TO BEDS UNDER NAVIGABLE WATERS,
W70-00539 06E

OWNERSHIP OF BEDS POWER TO CONVEY WHEN STATE HAS TITLE.
W70-00547 06E

FISHING AND RECREATIONAL RIGHTS IN IOWA STREAMS AND LAKES.
W70-00552 06E

RIPARIAN RIGHTS IN FLORIDA,
W70-00555 06E

W70-00556 06E

W70-00557 06E

W70-00558 06E

THE NAVIGATION SERVITUDE AND JUST COMPENSATION--STRUGGLE FOR A DOCTRINE,
W70-00559 04A

CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
W70-00569 04A

SWAN ISLAND CLUB V YARBROUGH (LANDS HELD IN TRUST FOR PUBLIC).
W70-00582 06E

COMMISSIONERS OF STEAMSHIP TERMINALS.
W70-00809 06E

NAVIGATION
PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.
W70-00496 06E

W70-00508 06E

W70-00516 06E

INTERFERENCE WITH THE PUBLIC RIGHT OF NAVIGATION AND THE RIPARIAN OWNER'S CLAIM OF PRIVILEGE,
W70-00546 06E

WATER NAVIGATION REGULATIONS.
W70-00587 06E

PUBLIC RIGHT AND THE RULE OF NO COMPENSATION,
W70-00785 04A

NAVIGATION PROVISIONS
THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
W70-00766 05G

NAVIGATION SERVITUDE
THE NAVIGATION SERVITUDE AND JUST COMPENSATION--STRUGGLE FOR A DOCTRINE,
W70-00559 04A

PUBLIC RIGHT AND THE RULE OF NO COMPENSATION,
W70-00785 04A

NEBRASKA
AVAILABILITY OF GROUND WATER IN YORK COUNTY, NEBRASKA,
W70-00472 02F

NETHERLANDS
HYDROLOGY OF SOUTH BONAIRE, N. A. - A ROCK SELECTIVE DOLOMITIZATION MODEL,
W70-00441 02F

NETS
LICENSES NETS, SEINES, AND TRAPS.
W70-00432 06E

NETS AND SEINES, STURGEON, SHAD, AND HERRING SEASON.
W70-00585 06E

NETWORK DESIGN
SOME METEOROLOGICAL REQUIREMENTS IN WATERSHED ENGINEERING RESEARCH,
W70-00474 07A

NEVADA
OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
W70-00711 02H

NEW JERSEY
GROUNDWATER RESOURCES OF MONMOUTH COUNTY, NEW JERSEY,
W70-00465 02F

NEW SOUTH WALES
RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
W70-00698 02E

NEW YORK
RESULTS OF SUBSURFACE EXPLORATION IN THE MID-ISLAND AREA OF WESTERN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
W70-00455 02F

A RECONNAISSANCE OF STREAM SEDIMENT IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00466 02J

GROUNDWATER RESOURCES OF THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00687 02F

CHEMICAL QUALITY OF STREAMS IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00688 02K

SURFACE WATER IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00689 02E

CASTAWAYS MOTEL V SCHUYLER (PERMISSION TO BUILD A BULKHEAD).
W70-00735 06E

FRONTIER TOWN PROPERTIES, INC V STATE (CONDEMNATION VALUE OF WATER USE).
W70-00805 06C

NEW ZEALAND
STRATIGRAPHY AND SEDIMENTOLOGY OF THE TERTIARY ROCKS OF THE MANDAMUS-DOVE RIVER AREA, NORTH CANTERBURY, NEW ZEALAND,
W70-00644 02J

RECENT SEDIMENTATION AROUND NORTHERNMOST NEW ZEALAND,

W70-00645 02J

EARTHFLOW OCCURRENCE DURING HIGH INTENSITY RAINFALL IN EASTERN OTAGO (NEW ZEALAND),
W70-00647 02B

RELATIONSHIPS BETWEEN GRAIN SIZE, SIZE-SORTING, AND FORESHORE SLOPE ON MIXED SAND-SHINGLE BEACHES,
W70-00651 02L

SEDIMENTOLOGY OF THE WAITEMATA GROUP IN THE STANLEY POINT-DEVONPORT AREA, AUCKLAND, NEW ZEALAND,
W70-00652 02J

SEDIMENTARY FEATURES AND PENECONTEMPORANEOUS SLUMPING IN THE WAITEMATA GROUP, WHANGAPARAOA PENINSUAL, NORTH AUCKLAND, NEW ZEALAND,
W70-00653 02J

OFF-SHORE SEDIMENTS, NORTH-WEST NELSON, SOUTH ISLAND, NEW ZEALAND,
W70-00660 02L

THE APPEARANCE AND ORIGIN OF COLOURS IN MUDDY MARINE SEDIMENTS AROUND NEW ZEALAND,
W70-00661 02L

NIAGARA RIVER
CASTAWAYS MOTEL V SCHUYLER (PERMISSION TO BUILD A BULKHEAD).
W70-00735 06E

NIGERIA
SURFACE-WATER RESOURCES OF THE YOBE RIVER SYSTEM, NORTHERN NIGERIA, 1963-68,
W70-00456 02A

NITROGEN
CHEMICAL PROCESSING OF WASTEWATER FOR NUTRIENT REMOVAL,
W70-00680 05D

NONMARKET-PRICED PHENOMENON
SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

NON-CONSUMPTIVE USE
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 4 NONCONSUMPTIVE USES OF NATURAL NAVIGABLE WATERBODIES,
W70-00531 06E

NON-NAVIGABLE WATERS
RIPARIAN RIGHTS IN FLORIDA,
W70-00555 06E

W70-00556 06E

W70-00558 06E

NON-RIPARIAN OWNERS
RIPARIAN RIGHTS - RIGHT TO FOLLOW ACCRETIONS ACROSS FIXED BOUNDARY LINE.
W70-00803 04A

NON-STRUCTURAL ALTERNATIVE
FLOOD CONTROL POLICY AND FLOOD MANAGEMENT,
W70-00728 06F

NON-TIDAL WATERS
NETS AND SEINES, STURGEON, SHAD, AND HERRING SEASON.
W70-00585 06E

NORTH CANTERBURY
STRATIGRAPHY AND SEDIMENTOLOGY OF THE TERTIARY ROCKS OF THE MANDAMUS-DOVE RIVER AREA, NORTH CANTERBURY, NEW ZEALAND,
W70-00644 02J

NORTH CAROLINA
REAL PROPERTY DISPOSITION OF DIFFUSED SURFACE WATERS IN NORTH CAROLINA.
W70-00561 04A

ESTUARINE LAND OF NORTH CAROLINA LEGAL ASPECTS OF OWNERSHIP, USE, AND CONTROL,
W70-00565 06E

SWAN ISLAND CLUB V YARBROUGH (LANDS HELD IN TRUST FOR PUBLIC).
W70-00582 06E

NORTHERN WISCONSIN
THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
W70-00765 02I

NUCLEAR POWER PLANTS
ENVIRONMENTAL SURVEILLANCE AROUND A NUCLEAR FUEL REPROCESSING INSTALLATION, 1965-1967,
W70-00677 05C

NUCLEAR POWERPLANTS
TRITIUM IN THE ENVIRONMENT FROM NUCLEAR POWERPLANTS,
W70-00716 05B

NUTRIENT CYCLES
EFFECTS OF FERTILIZERS ON WATER QUALITY.
W70-00717 05C

NUTRIENT REMOVAL
CHEMICAL PROCESSING OF WASTEWATER FOR NUTRIENT REMOVAL,
W70-00680 05D

NUTRIENT REQUIREMENTS
THE ISOLATION, PURIFICATION, AND NUTRIENT SOLUTION REQUIREMENTS OF BLUE-GREEN ALGAE,
W70-00719 05C

NUTRIENTS
BACTERIA, CARBON DIOXIDE, AND ALGAL BLOOMS,
W70-00664 05C

CHEMICAL PROCESSING OF WASTEWATER FOR NUTRIENT REMOVAL,
W70-00680 05D

OAHU
HYDROGRAPH STUDY AND PEAK DISCHARGE DETERMINATION OF HAWAIIAN SMALL WATERSHEDS ISLAND OF OAHU,
W70-00449 02A

OAK RIDGE(TENN)
HYDROLOGIC DATA FOR THE OAK RIDGE AREA, TENNESSEE,
W70-00476 02E

OASES
NOTES ON PROBLEMS OF IRRIGATION IN THREE LIBYAN OASES,
W70-00703 04B

OBSTRUCTION TO FLOW
PROPERTY RIGHTS OF RIPARIAN OWNER IN MISSOURI WITH RESPECT TO OBSTRUCTION OF A NATURAL OR ARTIFICIAL WATERCOURSE,
W70-00525 06E

DRAINS RIGHT-OF-WAYS--OBSTRUCTIONS--CROSSINGS--CONNECTIONS.
W70-00595 04A

CONOBRE V FRITSCH (NATURAL WATERCOURSES).
W70-00720 04A

OCEANOGRAPHY
A DIVERSIFIED PROGRAM FOR THE STUDY OF SHALLOW WATER SEARCHING AND MAPPING TECHNIQUES,
W70-00461 07B

AN EXPERIMENTAL IN SITU DENSITOMETER,
W70-00462 07B

OPTICAL OCEANOGRAPHY,
W70-00464 07B

OCEANS
THE TERRITORIAL SEA A QUEST FOR UNIFORMITY,
W70-00519 06E

UNITED STATES LEGISLATION RELATING TO THE CONTINENTAL SHELF,
W70-00773 06E

OIL POLLUTION OF THE SEA.
W70-00786 05G

OIL POLLUTION OF THE SEA DETECTION.
W70-00795 05A

OHIO
THE USE OF INVERTEBRATES IN A WATER QUALITY INVESTIGATION A BIOLOGICAL STUDY OF THE MIAMI RIVER, OHIO,
W70-00475 05C

CONOBRE V FRITSCH (NATURAL WATERCOURSES).
W70-00720 04A

OHIO RIVER
WATER BOUNDARIES,
W70-00570 04A

OHIO RIVER VALLEY WATER SANITATION COMPACT.
W70-00826 05G

OIL FIELDS
REDUCING LAND SUBSIDENCE IN THE WILMINGTON OIL FIELD BY THE USE OF SALINE WATERS,
W70-00447 05G

OIL INDUSTRY
OIL POLLUTION OF THE SEA THE EFFORTS OF THE OIL AND SHIPPING INDUSTRIES.
W70-00794 05G

OIL POLLUTION
OIL POLLUTION OF THE SEA.
W70-00786 05G

OIL POLLUTION AND THE SEA THE SOURCES OF POLLUTION.
W70-00787 05B

OILY WATER
MECHANICAL RETRIEVAL OF WASTE OILS AND SOLIDS FROM WATER,
W70-00685 05D

RECOVERY OF WASTE OIL USING FLOATING-TYPE SKIMMERS,
W70-00686 05D

OPEN SEA
THE UPTAKE, ACCUMULATION AND EXCHANGE OF STRONTIUM-90 BY OPEN SEA PHYTOPLANKTON,
W70-00707 05C

OPERATING COSTS
COST OF MUNICIPAL SEWAGE TREATMENT,
W70-00493 05D

W70-00493 05D

OPERATION AND MAINTENANCE
SNOWY RANGE WATER RESOURCE OBSERVATORY (A PROGRESS REPORT).
W70-00480 07C

OPTICAL METHODS
OPTICAL METHOD FOR DETERMINING PARTICLE SIZES OF COARSE SEDIMENT,
W70-00655 02J

OPTICAL OCEANOGRAPHY
OPTICAL OCEANOGRAPHY,
W70-00464 07B

OPTICAL PROPERTIES
OPTICAL OCEANOGRAPHY,
W70-00464 07B

OPTIMIZATION
OPTIMAL WATER ALLOCATION THE NORTH PLATTE RIVER,
W70-00629 06D

OPTIMUM ALLOCATION OF WATER RESOURCES BY MATHEMATICAL PROGRAMMING,
W70-00641 06A

COMPUTER-ORIENTED METHOD OF OPTIMIZING HYDROLOGIC MODEL PARAMETERS,
W70-00642 06A

OPTIMUM INESTMENT IN STRUCTURAL FLOOD CONTROL,
W70-00729 06B

OPTIMUM DEVELOPMENT PLANS
INDIANA BOARD OF PUBLIC HARBORS AND TERMINALS.
W70-00591 06E

OREGON
GROUNDWATER RECONNAISSANCE IN THE BURNT RIVER VALLEY AREA, OREGON,
W70-00468 02F

CORRELATION AND ANALYSIS OF WATER-TEMPERATURE DATA FOR OREGON STREAMS,
W70-00470 02E

ORGANIC ACIDS
NATURAL ORGANIC ACIDS IN THE TRANSPORTATION, DEPOSITION, AND CONCENTRATION OF GOLD,
W70-00425 02K

ORGANIC SOILS
PHYSICAL PROPERTIES OF PEATS AS RELATED TO DEGREE OF DECOMPOSITION,
W70-00761 02G

OWNERSHIP OF BEDS
CIVIL LAW PPOPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
W70-00526 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 12 TITLE TO BEDS UNDER NAVIGABLE WATERS,
W70-00539 06E

OWNERSHIP OF BEDS POWER TO CONVEY WHEN STATE HAS TITLE.
W70-00547 06E

CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
W70-00569 04A

THE LAW OF NAVIGABLE STREAMS IN WEST VIRGINIA,
W70-00576 06E

SWAN ISLAND CLUB V YARBROUGH (LANDS HELD IN TRUST FOR PUBLIC).
W70-00582 06E

UNITED STATES LEGISLATION RELATING TO THE CONTINENTAL SHELF,
W70-00773 06E

ISLANDS AND ABANDONED RIVER CHANNELS.
W70-00817 04A

OXIDATION
OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
W70-00428 02K

OXYGEN
BIOCHEMICAL OXYGEN DEMAND AND DEGRADATION OF LIGNIN IN NATURAL WATERS,
W70-00681 05B

EFFECT OF PHOTOSYNTHESIS ON OXYGEN SATURATION,
W70-00683 05C

OXYGEN SUPERSATURATION
EFFECT OF PHOTOSYNTHESIS ON OXYGEN SATURATION,
W70-00683 05C

OYSTERS
NATURAL RESOURCES (OYSTERS AND CLAMS).
W70-00811 06E

PALEOZOIC ERA
ON THE GEOCHEMISTRY OF UPPER PALEOZOIC AND LOWER MESOZOIC SEDIMENTS OF THE NORTHERN PART OF THE CISVERKHOYANSK TROUGH (RUSSIAN),
W70-00429 02K

PARAMETRIC HYDROLOGY
COMPUTER-ORIENTED METHOD OF OPTIMIZING HYDROLOGIC MODEL PARAMETERS,
W70-00642 06A

THE USE OF EXPONENTIAL FUNCTIONS WHEN CONSTRUCTING THE LAWS OF THE DISTRIBUTION OF GEOGRAPHICAL AND HYDROMETEOROLOGICAL PARAMETERS (IN RUSSIAN),
W70-00657 02A

PARETO OPTIMALITY
EXTERNALITIES AND THE QUALITY OF AIR AND WATER,
W70-00490 05G

PARTICLE SIZE
GRAIN SIZE DISTRIBUTIONS AND DEPOSITIONAL PROCESSES,
W70-00639 02J

OPTICAL METHOD FOR DETERMINING PARTICLE SIZES OF COARSE SEDIMENT,
W70-00655 02J

PEAK DISCHARGE
RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
W70-00698 02E

PEAT
PHYSICAL PROPERTIES OF PEATS AS RELATED TO DEGREE OF DECOMPOSITION,
W70-00761 02G

PENALTIES(CRIMINAL)
POWERS AND DUTIES OF THE DIRECTOR OF THE DIVISION OF FISH AND GAME AND OF GAME WARDENS.
W70-00431 06E

PER CAPITA INCOME
THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
W70-00693 06B

PERCOLATING WATER
LIABILITY OF LANDOWNERS FOR POLLUTION OF PERCOLATING WATERS,
W70-00521 05G

PERIPHYTON
THE USE OF ARTIFICIAL SUBSTRATES IN POLLUTION SURVEYS,
W70-00666 05B

PERMITS
LICENSES NETS, SEINES, AND TRAPS.
W70-00432 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 6 STATUTORY MODIFICATIONS OF EASTERN CONSUMPTIVE USE DOCTRINES,
W70-00533 06E

HUNTING AND FISHING LICENSES.
W70-00807 06E

MUSSELS.
W70-00834 06E

PESTICIDE TOXICITY
GROWTH AND RESISTANCE TO STRESS IN BROOK TROUT FED SUBLETHAL LEVELS OF DDT,
W70-00684 05C

PESTICIDES
POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
W70-00709 05C

PESTICIDES AND FISHES--A REVIEW OF SELECTED LITERATURE,
W70-00718 05C

PHENOLS
THE EFFECT OF TEMPERATURE ON THE ACUTE TOXICITY OF PHENOL TO RAINBOW TROUT IN HARD WATER,
W70-00746 05C

PHOSPHORUS
CHEMICAL PROCESSING OF WASTEWATER FOR NUTRIENT REMOVAL,
W70-00680 05D

VERTICAL DISTRIBUTION OF PHOSPHORUS IN LINSLEY POND MUD,
W70-00712 02H

PHOTOSYNTHESIS
EFFECT OF PHOTOSYNTHESIS ON OXYGEN SATURATION,
W70-00683 05C

CONTRIBUTION OF PHOTOSYNTHETIC REAERATION TO TOTAL REAERATION OF THE PASSAIC RIVER,
W70-00731 05B

PHYTOPLANKTON
THE UPTAKE, ACCUMULATION AND EXCHANGE OF STRONTIUM-90 BY OPEN SEA PHYTOPLANKTON,
W70-00707 05C

THE ROLE OF PHYTOPLANKTON IN THE CYCLING OF RADIONUCLIDES IN THE MARINE ENVIRONMENT,
W70-00708 05C

PLANKTON
THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
W70-00434 02K

PLANNING
THE ROLE OF MARINE SCIENCES IN THE MULTIPLE USES OF THE

COASTAL ZONE OF LAKE ERIE AND LAKE SUPERIOR,
W70-00457 02L

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 13 A LOOK TO THE FUTURE,
W70-00540 04A

ON SOME MEANINGS OF 'PLANNING',
W70-00611 06G

COMMENT ON THE PLACE OF WATER RESOURCES PLANNING IN ECONOMIC REGIONAL DEVELOPMENT,
W70-00614 06B

POTENTIAL SOCIOLOGICAL RESEARCH IN WATER RESOURCES DEVELOPMENT,
W70-00757 06B

PLANT SIZING
PLANT SIZING FOR A SEASONAL PRODUCT DEMAND USING A LINEAR PROGRAMMING MODEL,
W70-00604 06A

PLANTS
OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
W70-00711 02H

POINT SETS
ALLOCATION OF RESOURCES AND THE PRICE SYSTEM,
W70-00631 06B

POLAND
A NOTE ON THE DEPENDENCE BETWEEN THE CONCENTRATION OF CHLORIDE IONS AND THE RADIOACTIVITY OF EMANATION DISSOLVED IN MINERAL WATERS (IN POLISH),
W70-00668 05A

POLITICAL ASPECTS
DEVELOPING POSITIVE PUBLIC ATTITUDES FOR WATER RESOURCE DEVELOPMENT,
W70-00514 06B

POLLUTANT IDENTIFICATION
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

POLLUTANTS
MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,
W70-00682 05B

POLLUTION ABATEMENT
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 11 THE LAW AND ADMINISTRATION OF POLLUTION CONTROL IN FLORIDA,
W70-00538 06E

THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
W70-00766 05G

FEDERAL AIR AND WATER CONTROL THE APPLICATION OF THE COMMERCE POWER TO ABATE INTERSTATE AND INTRASTATE POLLUTION,
W70-00771 05G

OIL POLLUTION OF THE SEA THE INTERNATIONAL RESPONSE.
W70-00790 05G

OIL POLLUTION OF THE SEA THE EFFORTS OF THE OIL AND SHIPPING INDUSTRIES.
W70-00794 05G

OIL POLLUTION OF THE SEA CLEANING UP.
W70-00796 05D

OHIO RIVER VALLEY WATER SANITATION COMPACT.
W70-00826 05G

POLYCHLORINATED BIPHENYLAS
POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
W70-00709 05C

PONDS
COMPARATIVE ECOLOGY OF SANDSPIT PONDS,
W70-00671 02L

POROSITY
PORE STUDIES OF HIGHLY INDURATED APPALACHIAN ROCKS,
W70-00659 02F

POROUS MEDIA
FORCES ACTING UPON THE SOLID PHASE OF A POROUS MEDIUM,
W70-00459 02G

PORT AUTHORITIES
INDIANA BOARD OF PUBLIC HARBORS AND TERMINALS.
W70-00591 06E

POTOMAC RIVER
BROWN V BOWLES (OFFSHORE FISHING RIGHTS).
W70-00589 06E

PRECIPITATION GAGES
HYDROLOGICAL REQUIREMENTS FOR WEATHER RADAR DATA,
W70-00673 02B

PRECIPITATION(ATMOSPHERIC)
HYDROLOGICAL REQUIREMENTS FOR WEATHER RADAR DATA,
W70-00673 02B

POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

PRICE SYSTEM
THREE ESSAYS ON THE STATE OF ECONOMIC SCIENCE,
W70-00630 06B

ALLOCATION OF RESOURCES AND THE PRICE SYSTEM,
W70-00631 06B

PRICES
EFFLUENT CHARGES,
W70-00489 05G

ASSET PRICES IN ECONOMIC ANALYSIS,
W70-00626 06C

PRIOR APPROPRIATION
IOWA WATER LAW PROBLEMS TO BE CONSIDERED.
W70-00573 06E

NORTH CAROLINA AND OTHER ATLANTIC STATES,
W70-00770 06E

PRIORITY SYSTEM
OPTIMAL WATER ALLOCATION THE NORTH PLATTE RIVER,
W70-00629 06D

PRIVATE GOOD
PUBLIC VS. PRIVATE GOODS,
W70-00491 05G

PRIVATE PROPERTY RIGHTS
THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
W70-00766 05G

PROGRAMS
POLLUTION OF WATERS OF STATE.
W70-00578 05G

PROJECT PURPOSES
CURRENT LEGISLATION,
W70-00776 06E

PROJECT-INDUCED ECONOMIC GROWTH
FLOOD CONTROL POLICY AND FLOOD MANAGEMENT,
W70-00728 06F

OPTIMUM INESTMENT IN STRUCTURAL FLOOD CONTROL,
W70-00729 06B

PROVENANCE
CHARACTERISTICS OF COLUMBIA RIVER SEDIMENT AND SEDIMENT TRANSPORT,
W70-00446 02J

RECENT SEDIMENTATION AROUND NORTHERNMOST NEW ZEALAND,
W70-00645 02J

OFF-SHORE SEDIMENTS, NORTH-WEST NELSON, SOUTH ISLAND, NEW ZEALAND,
W70-00660 02L

PUBLIC BENEFITS
PUBLIC UTILITIES (PUBLIC WATER DISTRICTS).
W70-00816 06E

PUBLIC FINANCE
EFFICIENCY IN GOVERNMENT SPENDING,
W70-00615 06B

PUBLIC GOOD
PUBLIC VS. PRIVATE GOODS,
W70-00491 05G

PUBLIC HEALTH
RESEARCH GOALS AND PROGRESS TOWARD THEM,
W70-00619 05G

WATER FOR PEOPLE,
W70-00756 06B

PUBLIC LANDS
TIDELANDS IN SOUTH CAROLINA A STUDY IN THE LAW OF REAL PROPERTY,
W70-00782 06E

PUBLIC OWNERSHIP
THE GREAT POND ORDINANCE--COLLECTIVISM IN NORTHERN NEW ENGLAND,
W70-00522 06E

PUBLIC POLICY
RESOURCE QUALITY NEW DIMENSIONS AND PROBLEMS FOR PUBLIC POLICY,
W70-00612 06A

PUBLIC RIGHTS
CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
W70-00526 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 4 NONCONSUMPTIVE USES OF NATURAL NAVIGABLE WATERBODIES,
W70-00531 06E

INTERFERENCE WITH THE PUBLIC RIGHT OF NAVIGATION AND THE RIPARIAN OWNER'S CLAIM OF PRIVILEGE,
W70-00546 06E

FISHING AND RECREATIONAL RIGHTS IN IOWA STREAMS AND LAKES.
W70-00551 06E

CIVIL LAW PROPERTY--BEDS OF NAVIGABLE WATERS--SUSCEPTIBILITY OF PRIVATE OWNERSHIP.
W70-00569 04A

PUMPING
APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
W70-00679 04A

PURIFICATION
THE ISOLATION, PURIFICATION, AND NUTRIENT SOLUTION REQUIREMENTS OF BLUE-GREEN ALGAE,
W70-00719 05C

PYROLYSIS-METHANE METHOD
MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,
W70-00682 05B

QANATS
THE QANATS OF IRAN,
W70-00692 04B

WATER SUPPLY, USE AND MANAGEMENT,
W70-00706 04B

QUALITY
NATURAL RESOURCES QUALITY AND QUANTITY.
W70-00605 06G

QUALITY IN THE CONTROL OF QUANTITY,
W70-00606 06G

QUALITY CONTROL
THE USE OF SUBSIDIES FOR WASTE ABATEMENT,
W70-00488 05G

QUALITY MANAGEMENT
RESEARCH GOALS AND PROGRESS TOWARD THEM,
W70-00619 05G

QUANTIFICATION
THE QUEST FOR QUALITY IN THE ADMINISTRATION OF RESOURCES,
W70-00610 06G

QUANTITY
NATURAL RESOURCES QUALITY AND QUANTITY.
W70-00605 06G

QUALITY IN THE CONTROL OF QUANTITY,
W70-00606 06G

RADAR
HYDROLOGICAL REQUIREMENTS FOR WEATHER RADAR DATA,
W70-00673 02B

RADAR-COMPUTED RAINFALL
RADAR-COMPUTED RAINFALL COMPARED WITH OBSERVATIONS FROM A DENSE NETWORK OF RAIN GAUGES,
W70-00483 07A

RADIATION
A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
W70-00678 05G

RADIOACTIVE WASTES
ENVIRONMENTAL SURVEILLANCE AROUND A NUCLEAR FUEL REPROCESSING INSTALLATION, 1965-1967,
W70-00677 05C

A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
W70-00678 05G

RADIOACTIVITY TECHNIQUES
THE USE OF RADON-222 IN SURFACE WATERS IN GEOCHEMICAL PROSPECTING FOR URANIUM,
W70-00421 02J

RADIOCHEMICAL ANALYSIS
THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
W70-00434 02K

A NOTE ON THE DEPENDENCE BETWEEN THE CONCENTRATION OF CHLORIDE IONS AND THE RADIOACTIVITY OF EMANATION DISSOLVED IN MINERAL WATERS (IN POLISH),
W70-00668 05A

RADIOISOTOPES
THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
W70-00434 02K

THE ROLE OF PHYTOPLANKTON IN THE CYCLING OF RADIONUCLIDES IN THE MARINE ENVIRONMENT,
W70-00708 05C

RADIONUCLIDE ACCUMULATION
THE UPTAKE, ACCUMULATION AND EXCHANGE OF STRONTIUM-90 BY OPEN SEA PHYTOPLANKTON,
W70-00707 05C

RADIONUCLIDE EXCHANGE
THE UPTAKE, ACCUMULATION AND EXCHANGE OF STRONTIUM-90 BY OPEN SEA PHYTOPLANKTON,
W70-00707 05C

RADIONUCLIDE UPTAKE
THE UPTAKE, ACCUMULATION AND EXCHANGE OF STRONTIUM-90 BY OPEN SEA PHYTOPLANKTON,
W70-00707 05C

RADIUM RADIOISOTOPES
OCEANIC CONCENTRATIONS OF RADIUM-228,
W70-00435 02K

RAINFALL
EARTHFLOW OCCURRENCE DURING HIGH INTENSITY RAINFALL IN EASTERN OTAGO (NEW ZEALAND),
W70-00647 02B

RAINFALL DISTRIBUTION
A CLIMATOLOGICAL EVALUATION OF PRECIPITATION PATTERNS,
W70-00740 04C

RAINFALL INTENSITY
RADAR-COMPUTED RAINFALL COMPARED WITH OBSERVATIONS FROM A DENSE NETWORK OF RAIN GAUGES,
W70-00483 07A

RAINFALL-RUNOFF RELATIONSHIPS
GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
W70-00440 02E

HYDROGRAPH STUDY AND PEAK DISCHARGE DETERMINATION OF HAWAIIAN SMALL WATERSHEDS ISLAND OF OAHU,
W70-00449 02A

RAINGAGES
A CLIMATOLOGICAL EVALUATION OF PRECIPITATION PATTERNS,
W70-00740 04C

RAJASTHAN DESERT
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

RAJPUTANA DESERT
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

REASONABLE USE
IRRIGATION IN KENTUCKY AS AFFECTED BY THE LAW OF RIPARIAN RIGHTS,
W70-00571 03F

LAWS OF FLORIDA GOVERNING WATER USE,
W70-00769 06D

RECESSION CURVES
HYDROGRAPH STUDY AND PEAK DISCHARGE DETERMINATION OF HAWAIIAN SMALL WATERSHEDS ISLAND OF OAHU,
W70-00449 02A

RECIPROCAL EASEMENTS
RIPARIAN RIGHTS IN ARTIFICIAL LAKES AND STREAMS,
W70-00797 04A

RECLAMATION
DRAINAGE AND RECLAMATION ACT OF 1912.
W70-00821 04A

W70-00822 04A

W70-00823 04A

W70-00824 04A

W70-00825 04A

RECREATION
A MEASURE OF WATER RECREATION BENEFITS THE MERAMEC BASIN EXAMPLE,
W70-00507 06B

FISH AND GAME.
W70-00588 06E

SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

PROBLEMS OF QUALITY AND QUANTITY IN THE MANAGEMENT OF THE LIVING RESOURCES OF THE SEA,
W70-00608 06G

OUTDOOR RECREATION,
W70-00623 06B

RECREATION DEMAND
FISHING AND RECREATIONAL RIGHTS IN IOWA STREAMS AND LAKES.
W70-00550 06E

W70-00551 06E

W70-00552 06E

W70-00553 06E

RECREATIONAL ENVIRONMENT
ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
W70-00730 05G

REDUCTION(CHEMICAL)
OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
W70-00428 02K

REGIONAL ANALYSIS
FORECASTING REGIONAL ECONOMIC GROWTH SOME PROBLEMS AND PITFALLS,
W70-00498 06B

WATER RESOURCES PLANNING IN AUSTRALIA,
W70-00704 06B

REGULATION
POWERS AND DUTIES OF THE DIRECTOR OF THE DIVISION OF FISH AND GAME AND OF GAME WARDENS.
W70-00431 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 6 STATUTORY MODIFICATIONS OF EASTERN CONSUMPTIVE USE DOCTRINES,
W70-00533 06E

A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
W70-00678 05G

CANALS AND WATERWAYS.
W70-00814 04A

LEVEES.
W70-00818 04A

MUSSELS.
W70-00834 06E

RELATIVE RIGHTS
LIABILITY OF LANDOWNERS FOR POLLUTION OF PERCOLATING WATERS,
W70-00521 05G

FISHING AND RECREATIONAL RIGHTS IN IOWA STREAMS AND LAKES.
W70-00550 06E

W70-00553 06E

REAL PROPERTY--WATER RIGHTS--PUBLIC RIGHTS OF FISHING AND NAVIGATION OVER FLOODED LANDS.
W70-00575 04A

REMEDIES
LIABILITY OF LANDOWNERS FOR POLLUTION OF PERCOLATING WATERS,
W70-00521 05G

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 7 RIGHTS IN DISPOSAL OF DIFFUSED SURFACE WATER,
W70-00534 06E

OIL POLLUTION OF THE SEA PRIVATE REMEDIES.
W70-00793 05G

REMOTE SENSING
DIRECT ILLUSTRATION OF ONE WAY SAND TRANSPORT BY TIDAL CURRENTS,
W70-00436 02J

A DIVERSIFIED PROGRAM FOR THE STUDY OF SHALLOW WATER SEARCHING AND MAPPING TECHNIQUES,
W70-00461 07B

APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
W70-00636 07B

REMOVAL
REMOVAL OF VEGETATION FROM WATERCOURSES.
W70-00437 04A

REPULSION(LEGAL ASPECTS)
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 7 RIGHTS IN DISPOSAL OF DIFFUSED SURFACE WATER,
W70-00534 06E

COMMON LAW RIGHTS TO SURFACE WATERS,
W70-00799 04A

RESEARCH AND DEVELOPMENT
WATER-RELATED RESEARCH FOR THE GREAT LAKES REGION,
W70-00433 02H

AREAS OF DEFICIENCY AND RESEARCH NEEDS IN WATER RESOURCE PLANNING,
W70-00501 06B

GOVERNMENT RESEARCH AND DEVELOPMENT PROGRAMS,
W70-00621 06B

RESEARCH PERSPECTIVE FOR SOCIOLOGICAL PROBLEMS INVOLVING WATER RESOURCES,
W70-00755 06B

RESEARCH EQUIPMENT
MEASURING ANGLES WITH A CARPENTER'S FOLDING RULER,
W70-00760 07B

RESEARCH FACILITIES
ANNUAL REPORT FISCAL YEAR 1968-69,
W70-00733 09D

RESEARCH GRANTS
ANNUAL REPORT FISCAL YEAR 1968-69,
W70-00733 09D

RESEARCH POLICIES
ANTICIPATING THE NATIONS NEED FOR ECONOMIC KNOWLEDGE,
W70-00620 6B

RESERVOIRS
COMPUTATION OF THE COMPONENTS OF THE THERMAL BALANCE OF PLANNED RESERVOIRS,
W70-00744 02D

RESOURCE ALLOCATION
PUBLIC VS. PRIVATE GOODS,
W70-00491 05G

MEASURING BENEFITS OF GOVERNMENT INVESTMENTS.
W70-00622 06B

THREE ESSAYS ON THE STATE OF ECONOMIC SCIENCE,
W70-00630 06B

ALLOCATION OF RESOURCES AND THE PRICE SYSTEM,
W70-00631 06B

RESOURCE MANAGEMENT
THE ECOSYSTEM AS A CONCEPTUAL TOOL IN THE MANAGEMENT OF NATURAL RESOURCES,
W70-00609 06G

RESOURCE QUALITY
RESOURCE QUALITY AND VALUE OF THE LANDSCAPE,
W70-00607 06G

RESOURCE QUALITY NEW DIMENSIONS AND PROBLEMS FOR PUBLIC POLICY,
W70-00612 06A

RESOURCES QUALITY
THE QUEST FOR QUALITY IN THE ADMINISTRATION OF RESOURCES,
W70-00610 06G

RESTRICTIVE COVENANTS
SHOREFRONT PARK IMPROVEMENT ASSOCIATION, INC V KING (RIPARIAN RIGHTS AND RESTRICTIONS ON THE RIPARIAN LAND).
W70-00812 06E

RETAINED-RIGHT THEORY
THE APPROPRIATION OF PROPERTY FOR LEVEES A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
W70-00564 04A

REVIEWS
HYDROLOGY OF CARBONATE ROCK TERRANES, A REVIEW-WITH SPECIAL REFERENCE TO THE UNITED STATES (PART 1),
W70-00454 02F

BENEFIT-COST ANALYSIS FOR WATER RESOURCE PROJECTS A SELECTED ANNOTATED BIBLIOGRAPHY,
W70-00495 06B

BACTERIA, CARBON DIOXIDE, AND ALGAL BLOOMS,
W70-00664 05C

PESTICIDES AND FISHES--A REVIEW OF SELECTED LITERATURE,
W70-00718 05C

RIDDANCE(LEGAL ASPECTS)
REAL PROPERTY DISPOSITION OF DIFFUSED SURFACE WATERS IN NORTH CAROLINA,
W70-00561 04A

COMMON LAW RIGHTS TO SURFACE WATERS,
W70-00799 04A

RIGHT OF ADJACENCY
LITTORAL RIGHTS ON THE GREAT LAKES,
W70-00574 06E

RIGHT-OF-WAY
DEPARTMENT OF CONSERVATION.
W70-00583 04C

RIPARIAN LAND
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 3 OWNERSHIP OF UPLAND AS THE SOURCE OF RIPARIAN RIGHTS,
W70-00530 06E

RIPARIAN RIGHTS IN FLORIDA,
W70-00557 06E

COMPENSATION FOR THE RIGHT OF ACCESS TO NAVIGABLE WATERS,
W70-00566 04A

LITTORAL RIGHTS ON THE GREAT LAKES,
W70-00574 06E

NAVIGABLE WATERS--RIGHT OF RIPARIAN OWNER TO ARTIFICIAL ACCRETION,
W70-00798 04A

RIPARIAN OWNERS
RIPARIAN RIGHTS - RIGHT TO FOLLOW ACCRETIONS ACROSS FIXED BOUNDARY LINE.
W70-00803 04A

RIPARIAN RIGHTS
WATER AND WATERCOURSES--RIPARIAN RIGHTS AS APPLIED TO ARTIFICIAL WATERCOURSES,
W70-00523 06E

PROPERTY RIGHTS OF RIPARIAN OWNER IN MISSOURI WITH RESPECT TO OBSTRUCTION OF A NATURAL OR ARTIFICIAL WATERCOURSE,
W70-00525 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 2 RIGHTS IN DEFINED WATERBODIES BASIC

CONSIDERATIONS,
W70-00529 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 3 OWNERSHIP OF UPLAND AS THE SOURCE OF RIPARIAN RIGHTS,
W70-00530 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 4 NONCONSUMPTIVE USES OF NATURAL NAVIGABLE WATERBODIES,
W70-00531 06E

CIVIL LAW PROPERTY--ALLUVION DISTINGUISHING LAKES FROM RIVERS AND STREAMS,
W70-00541 04D

EMINENT DOMAIN--NAVIGATIONAL SERVITUDE--EFFECT ON EVALUATION OF PORT SITE PROPERTY,
W70-00545 06E

INTERFERENCE WITH THE PUBLIC RIGHT OF NAVIGATION AND THE RIPARIAN OWNER'S CLAIM OF PRIVILEGE,
W70-00546 06E

REAL PROPERTY--EASEMENTS--CONSTRUCTION OF INSTRUMENT GRANTING RIGHT OF FLOWAGE,
W70-00548 04A

FISHING AND RECREATIONAL RIGHTS IN IOWA STREAMS AND LAKES.
W70-00550 06E

W70-00551 06E

W70-00552 06E

W70-00553 06E

RIPARIAN RIGHTS IN FLORIDA,
W70-00555 06E

W70-00556 06E

W70-00557 06E

W70-00558 06E

REAL PROPERTY--ALLUVION AND ACCRETION--ARTICLE 509 OF THE LOUISIANA CIVIL CODE,
W70-00560 06E

COMPENSATION FOR THE RIGHT OF ACCESS TO NAVIGABLE WATERS,
W70-00566 04A

THE RIGHT OF ACCESS TO NAVIGABLE WATERS--COMPENSABILITY UNDER EMINENT DOMAIN,
W70-00567 04A

WATER--AS A SPECIES OF PRIVATE PROPERTY--THE ILLINOIS VIEW,
W70-00568 04A

WATER BOUNDARIES,
W70-00570 04A

IRRIGATION IN KENTUCKY AS AFFECTED BY THE LAW OF RIPARIAN RIGHTS,
W70-00571 03F

LITTORAL RIGHTS ON THE GREAT LAKES,
W70-00574 06E

THE MOVEMENT FOR NEW WATER RIGHTS LAWS IN THE TENNESSEE VALLEY STATES,
W70-00577 06E

BROWN V BOWLES (OFFSHORE FISHING RIGHTS).
W70-00589 06E

THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
W70-00766 05G

THE WANDERING MISSOURI RIVER A STUDY IN ACCRETION LAW,
W70-00777 06E

W70-00778 06E

W70-00779 06E

W70-00780 06E

PUBLIC RIGHT AND THE RULE OF NO COMPENSATION,
W70-00785 04A

RIPARIAN RIGHTS IN ARTIFICIAL LAKES AND STREAMS,
W70-00797 04A

RIPARIAN RIGHTS - RIGHT TO FOLLOW ACCRETIONS ACROSS FIXED BOUNDARY LINE.
W70-00803 04A

SHOREFRONT PARK IMPROVEMENT ASSOCIATION, INC V KING (RIPARIAN RIGHTS AND RESTRICTIONS ON THE RIPARIAN LAND).
W70-00812 06E

PIERCE V RILEY (UNREASONABLE EXTENSION OF RIPARIAN RIGHTS).
W70-00813 06E

RIVER BASIN DEVELOPMENT
THE FEDERAL COMPREHENSIVE SURVEYS,
W70-00511 06B

PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.
W70-00516 06E

W70-00599 06E

RIVER BASINS
GLACIATION OF THE RIVER BASINS OF THE LEFT TRIBUTARIES OF THE ALAZANI AND THE PIRIKITA ALAZANI (IN GEORGIAN),
W70-00669 02C

RIVER SYSTEMS
SURFACE-WATER RESOURCES OF THE YOBE RIVER SYSTEM, NORTHERN NIGERIA, 1963-68,
W70-00456 02A

RIVERS
IMPLICATIONS OF THE MINOR ELEMENT CONTENT OF SOME MAJOR STREAMS OF THE WORLD,
W70-00478 02K

UNITED STATES RIVER TREATIES,
W70-00518 06E

RIVERS AND HARBORS ACT
RIVER AND HARBOR IMPROVEMENTS.
W70-00696 04A

RUNOFF
GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
W70-00440 02E

RUNOFF FROM SMALL PEATLAND WATERSHEDS,
W70-00675 02E

PHYSICAL INFLUENCES ON FLOW SERIAL CORRELATION,
W70-00723 02E

RUNOFF FORECASTING
GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
W70-00440 02E

RURAL AREAS
LAND USE ALONG A TROPICAL CLIMATIC BOUNDARY THE WALAWE GANGA BASIN OF CEYLON,
W70-00463 03B

SAND BARS
GEOMORPHOLOGY OF A SAND RIDGE,
W70-00453 02J

SAND SPITS
COMPARATIVE ECOLOGY OF SANDSPIT PONDS,
W70-00671 02L

SAND WAVES
DIRECT ILLUSTRATION OF ONE WAY SAND TRANSPORT BY TIDAL CURRENTS,
W70-00436 02J

SANDS
GRAIN SIZE DISTRIBUTIONS AND DEPOSITIONAL PROCESSES,
W70-00639 02J

ENVIRONMENTALLY SIGNIFICANT SEDIMENTOLOGIC CHARACTERISTICS OF BEACH SANDS,
W70-00650 02L

RELATIONSHIPS BETWEEN GRAIN SIZE, SIZE-SORTING, AND FORESHORE SLOPE ON MIXED SAND-SHINGLE BEACHES,
W70-00651 02L

SAPLINGS
THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
W70-00765 02I

SASKATCHEWAN
AN ORIENTATION STUDY OF THE URANIUM DISTRIBUTION IN LAKE WATERS, BEAVERLODGE DISTRICT, SASKATCHEWAN,
W70-00423 02H

SATURATION
EFFECT OF PHOTOSYNTHESIS ON OXYGEN SATURATION,
W70-00683 05C

SCULPINS
ACCUMULATION OF DIELDRIN BY FISH AND SELECTED FISH-FOOD ORGANISMS,
W70-00714 05C

SEA WATER
THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
W70-00434 02K

OCEANIC CONCENTRATIONS OF RADIUM-228,
W70-00435 02K

REDUCING LAND SUBSIDENCE IN THE WILMINGTON OIL FIELD BY THE USE OF SALINE WATERS,
W70-00447 05G

AN EXPERIMENTAL IN SITU DENSITOMETER,
W70-00462 07B

OPTICAL OCEANOGRAPHY,
W70-00464 07B

SEASONAL
SEASONAL SELECTION OF ESTUARINE BACTERIA BY WATER TEMPERATURE,

W70-00713 05C

SEASONAL PRODUCT DEMAND
PLANT SIZING FOR A SEASONAL PRODUCT DEMAND USING A LINEAR PROGRAMMING MODEL,
W70-00604 06A

SEDENTARY FISHERIES
SEDENTARY FISHERIES AND ARTICLE 2(4) OF THE CONVENTION ON THE CONTINENTAL SHELF - A PLEA FOR A SEPARATE REGIME,
W70-00772 06E

SEDIMENT LOAD
A RECONNAISSANCE OF STREAM SEDIMENT IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00466 02J

SEDIMENT TRANSPORT
DIRECT ILLUSTRATION OF ONE WAY SAND TRANSPORT BY TIDAL CURRENTS,
W70-00436 02J

CALCULATION OF SEDIMENT BALANCE OF THE LITTORAL ZONE (IN RUSSIAN),
W70-00649 02L

AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN LANDSCAPE-GEOMORPHOLOGICAL FACTORS AND SEDIMENT RUNOFF OF THE RIVERS OF THE WESTERN TRANSCAUCASUS (IN RUSSIAN),
W70-00656 02J

SEDIMENTARY ROCKS
STRATIGRAPHY AND SEDIMENTOLOGY OF THE TERTIARY ROCKS OF THE MANDAMUS-DOVE RIVER AREA, NORTH CANTERBURY, NEW ZEALAND,
W70-00644 02J

SEDIMENTARY STRUCTURES
SEDIMENTARY FEATURES AND PENECONTEMPORANEOUS SLUMPING IN THE WAITEMATA GROUP, WHANGAPARAOA PENINSUAL, NORTH AUCKLAND, NEW ZEALAND,
W70-00653 02J

SEDIMENTATION
QUANTITATIVE STATISTICAL ANALYSES OF COLUMBIA RIVER SEDIMENT SAMPLES,
W70-00438 02J

RECENT SEDIMENTATION AROUND NORTHERNMOST NEW ZEALAND,
W70-00645 02J

CALCULATION OF SEDIMENT BALANCE OF THE LITTORAL ZONE (IN RUSSIAN),
W70-00649 02L

SEDIMENTOLOGY OF THE WAITEMATA GROUP IN THE STANLEY POINT-DEVONPORT AREA, AUCKLAND, NEW ZEALAND,
W70-00652 02J

SEDIMENTOLOGY
QUANTITATIVE STATISTICAL ANALYSES OF COLUMBIA RIVER SEDIMENT SAMPLES,
W70-00438 02J

ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
W70-00445 02J

STRATIGRAPHY AND SEDIMENTOLOGY OF THE TERTIARY ROCKS OF THE MANDAMUS-DOVE RIVER AREA, NORTH CANTERBURY, NEW ZEALAND,
W70-00644 02J

SEDIMENTOLOGY OF THE WAITEMATA GROUP IN THE STANLEY POINT-DEVONPORT AREA, AUCKLAND, NEW ZEALAND,
W70-00652 02J

SEDIMENTARY FEATURES AND PENECONTEMPORANEOUS SLUMPING IN THE WAITEMATA GROUP, WHANGAPARAOA PENINSUAL, NORTH AUCKLAND, NEW ZEALAND,
W70-00653 02J

SEDIMENTS
ON THE GEOCHEMISTRY OF UPPER PALEOZOIC AND LOWER MESOZOIC SEDIMENTS OF THE NORTHERN PART OF THE CISVERKHOYANSK TROUGH (RUSSIAN),
W70-00429 02K

CHARACTERISTICS OF COLUMBIA RIVER SEDIMENT AND SEDIMENT TRANSPORT,
W70-00446 02J

RECENT SEDIMENTATION AROUND NORTHERNMOST NEW ZEALAND,
W70-00645 02J

ENVIRONMENTALLY SIGNIFICANT SEDIMENTOLOGIC CHARACTERISTICS OF BEACH SANDS,
W70-00650 02L

RELATIONSHIPS BETWEEN GRAIN SIZE, SIZE-SORTING, AND FORESHORE SLOPE ON MIXED SAND-SHINGLE BEACHES,
W70-00651 02L

OPTICAL METHOD FOR DETERMINING PARTICLE SIZES OF COARSE SEDIMENT,
W70-00655 02J

OFF-SHORE SEDIMENTS, NORTH-WEST NELSON, SOUTH ISLAND, NEW ZEALAND,
W70-00660 02L

THE APPEARANCE AND ORIGIN OF COLOURS IN MUDDY MARINE SEDIMENTS AROUND NEW ZEALAND,
W70-00661 02L

SEDIMENTS(MINERAL FRACTION;
VERTICAL DISTRIBUTION OF PHOSPHORUS IN LINSLEY POND MUD,
W70-00712 02H

SELENIUM ANALYSIS
RADIOMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF SELENIUM USING 3, 3' -DIAMINOBENZIDINE AS THE INITIAL REAGENT,
W70-00460 05A

SEPARATION TECHNIQUES
MECHANICAL RETRIEVAL OF WASTE OILS AND SOLIDS FROM WATER,
W70-00685 05D

SEWAGE EFFLUENTS
EFFLUENT CHARGES,
W70-00489 05G

SEWAGE FUNGUS ITS NATURE AND EFFECTS,
W70-00637 05C

SEWAGE FUNGUS
SEWAGE FUNGUS ITS NATURE AND EFFECTS,
W70-00637 05C

SEWAGE LAGOONS
COST OF MUNICIPAL SEWAGE TREATMENT,
W70-00493 05D

SHALLOW WELLS
NOTES ON PROBLEMS OF IRRIGATION IN THREE LIBYAN OASES,
W70-00703 04B

SHELLFISH
STATE OWNERSHIP AND SALE OF SEA SHELLS.
W70-00739 06E

SHELLS
STATE OWNERSHIP AND SALE OF SEA SHELLS.
W70-00739 06E

SHIPS
OPERATION AND EQUIPMENT OF VESSELS.
W70-00586 06E

OIL POLLUTION AND THE SEA THE SOURCES OF POLLUTION.
W70-00787 05B

CERTAIN FERRIES OPERATED BY CONNECTICUT.
W70-00808 06E

SHORES
APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
W70-00636 07B

SIMULATION
A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH VALIDITY TESTING OF A COMPARATIVE-PROJECTOR MODEL,
W70-00479 06A

SLOPE STABILITY
SEDIMENTARY FEATURES AND PENECONTEMPORANEOUS SLUMPING IN THE WAITEMATA GROUP, WHANGAPARAOA PENINSUAL, NORTH AUCKLAND, NEW ZEALAND,
W70-00653 02J

SLOPES
DIFFERENTIAL EQUATION OF THE EVOLUTION OF DELUVIAL SLOPES (IN RUSSIAN),
W70-00648 02J

SMALL FIRMS
COST OF CAPITAL TO THE SMALL FIRM,
W70-00616 06C

SMALL WATERSHEDS
HYDROGRAPH STUDY AND PEAK DISCHARGE DETERMINATION OF HAWAIIAN SMALL WATERSHEDS ISLAND OF OAHU,
W70-00449 02A

SNOW MANAGEMENT
SNOWPACK MANAGEMENT,
W70-00763 02C

SNOWMELT
SNOWPACK MANAGEMENT,
W70-00763 02C

SNOWPACKS
SNOWPACK MANAGEMENT,
W70-00763 02C

SNOWY MOUNTAINS
WATER RESOURCES PLANNING IN AUSTRALIA,
W70-00704 06B

SOCIAL ASPECTS
DEVELOPING POSITIVE PUBLIC ATTITUDES FOR WATER RESOURCE DEVELOPMENT,
W70-00514 06B

THE SONORAN DESERT ITS GEOGRAPHY, ECONOMY, AND PEOPLE,
W70-00700 06G

SOCIAL VALUES
RESEARCH PERSPECTIVE FOR SOCIOLOGICAL PROBLEMS INVOLVING WATER RESOURCES,
W70-00755 06B

SOCIOLOGY
RESEARCH PERSPECTIVE FOR SOCIOLOGICAL PROBLEMS INVOLVING WATER RESOURCES,
W70-00755 06B

SOIL CONSERVATION
ENGINEERING PHASES OF LAND TREATMENT RELATED TO INCREASING WATER-USE EFFICIENCY AND STORAGE EFFICIENCY RAINFALL,
W70-00448 04A

SOIL DENSITY
PHYSICAL PROPERTIES OF PEATS AS RELATED TO DEGREE OF DECOMPOSITION,
W70-00761 02G

SOIL DISPOSAL FIELDS
CHEMICAL INTERACTIONS OF WASTEWATER IN A SOIL ENVIRONMENT,
W70-00658 05D

SOIL MOISTURE
TRACTIONABILITY STUDY FOR THE LAOTIAN PANHANDLE,
W70-00484 02G

SOIL PROPERTIES
HYDROLOGY OF FROZEN GROUND FLOODS,
W70-00721 02C

SOIL WATER
PHYSICAL PROPERTIES OF PEATS AS RELATED TO DEGREE OF DECOMPOSITION,
W70-00761 02G

SOLUBILITY
EXPERIMENTAL DISSOLUTION OF CALCIUM, MAGNESIUM, AND STRONTIUM FROM RECENT BIOGENIC CARBONATES A MODEL OF DIAGENESIS,
W70-00444 02K

SONORAN DESERT
THE SONORAN DESERT ITS GEOGRAPHY, ECONOMY, AND PEOPLE,
W70-00700 06G

SORPTION
VERTICAL DISTRIBUTION OF PHOSPHORUS IN LINSLEY POND MUD,
W70-00712 02H

SOUTH CAROLINA
PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.
W70-00496 06E

W70-00508 06E

W70-00516 06E

W70-00599 06E

DRAINAGE DISTRICTS UNDER 1911 ACT.
W70-00715 04A

SOIL AND WATER CONSERVATION DISTRICTS LAW.
W70-00736 03F

DRAINAGE DISTRICTS UNDER 1911 ACT ORGANIZATION, POWERS AND EMPLOYEES OF COMMISSION FEES, ETC.
W70-00759 04A

RIGHTS OF WAY FOR DRAINAGE.
W70-00775 04A

TIDELANDS IN SOUTH CAROLINA A STUDY IN THE LAW OF REAL PROPERTY,
W70-00782 06E

COMMISSIONERS OF HEALTH AND DRAINAGE IN CERTAIN COUNTIES.
W70-00788 04A

SOUTHEAST US
THE MOVEMENT FOR NEW WATER RIGHTS LAWS IN THE TENNESSEE VALLEY STATES,
W70-00577 06E

SOVEREIGNTY
RIPARIAN RIGHTS IN FLORIDA,
W70-00555 06E

W70-00558 06E

SPATIAL BEHAVIOR
SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

SPATIAL DISTRIBUTION
SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

SPECTROMETERS
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

SPENDING
EFFICIENCY IN GOVERNMENT SPENDING,
W70-00615 06B

SPRINGS
OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
W70-00428 02K

A LIMNOLOGICAL STUDY OF A TENNESSEE COLD SPRINGBROOK,
W70-00672 02I

SPRINKLER IRRIGATION
SPRINKLER IRRIGATION,
W70-00695 03F

STAGE-DISCHARGE RELATIONS
STAGE-DISCHARGE CHARACTERISTICS OF A WEIR IN A SAND-CHANNEL STREAM,
W70-00418 02E

RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
W70-00698 02E

STANDARDS
DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00543 05G

W70-00544 05G

POLLUTION OF WATERS OF STATE.
W70-00580 05G

WATER POLLUTION CONTROL ACT.
W70-00806 05G

STATE GOVERNMENTS
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 9 STATE ADMINISTRATION OF WATER RESOURCES IN FLORIDA,
W70-00536 06E

OWNERSHIP OF BEDS POWER TO CONVEY WHEN STATE HAS TITLE.
W70-00547 06E

DRAINAGE DISTRICTS UNDER 1911 ACT ORGANIZATION, POWERS AND EMPLOYEES OF COMMISSION FEES, ETC.
W70-00759 04A

STATE JURISDICTION
MAKING THE STATE AN EFFECTIVE PARTNER IN WATER DEVELOPMENT,
W70-00513 06B

FEDERAL ENCROACHMENT ON STATE WATER RIGHTS,
W70-00549 06E

INTERSTATE COOPERATION IN RIVER BASIN DEVELOPMENT,
W70-00784 06B

STATE PARKS
HUNTING AND FISHING LICENSES.
W70-00807 06E

STATISTICAL METHODS
QUANTITATIVE STATISTICAL ANALYSES OF COLUMBIA RIVER SEDIMENT SAMPLES,
W70-00438 02J

STATISTICAL MODELS
GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
W70-00440 02E

STATISTICS
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 1 INTRODUCTION,
W70-00528 06E

STEAMSHIP TERMINALS
COMMISSIONERS OF STEAMSHIP TERMINALS.
W70-00809 06E

STRATIGRAPHY
STRATIGRAPHY AND SEDIMENTOLOGY OF THE TERTIARY ROCKS OF THE MANDAMUS-DOVE RIVER AREA, NORTH CANTERBURY, NEW ZEALAND,
W70-00644 02J

SEDIMENTOLOGY OF THE WAITEMATA GROUP IN THE STANLEY POINT-DEVONPORT AREA, AUCKLAND, NEW ZEALAND,
W70-00652 02J

STREAM FLOW
RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
W70-00698 02E

STREAMFLOW
NATURAL ORGANIC ACIDS IN THE TRANSPORTATION, DEPOSITION, AND CONCENTRATION OF GOLD,
W70-00425 02K

CORRELATION AND ANALYSIS OF WATER-TEMPERATURE DATA FOR OREGON STREAMS,
W70-00470 02E

AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN LANDSCAPE-GEOMORPHOLOGICAL FACTORS AND SEDIMENT RUNOFF OF THE RIVERS OF THE WESTERN TRANSCAUCASUS (IN RUSSIAN),
W70-00656 02J

SURFACE WATER IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00689 02E

STRESS ANALYSIS
FORCES ACTING UPON THE SOLID PHASE OF A POROUS MEDIUM,
W70-00459 02G

STRONTIUM RADIOISOTOPES
THE UPTAKE, ACCUMULATION AND EXCHANGE OF STRONTIUM-90 BY OPEN SEA PHYTOPLANKTON,
W70-00707 05C

STRUCTURAL GEOLOGY
ON THE GEOCHEMISTRY OF UPPER PALEOZOIC AND LOWER MESOZOIC SEDIMENTS OF THE NORTHERN PART OF THE CISVERKHOYANSK TROUGH (RUSSIAN),
W70-00429 02K

SUBDIVISIONS
SHOREFRONT PARK IMPROVEMENT ASSOCIATION, INC V KING (RIPARIAN RIGHTS AND RESTRICTIONS ON THE RIPARIAN LAND).
W70-00812 06E

SUBMERGED LANDS ACT
UNITED STATES LEGISLATION RELATING TO THE CONTINENTAL SHELF,
W70-00773 06E

SUBSIDENCE
REDUCING LAND SUBSIDENCE IN THE WILMINGTON OIL FIELD BY THE USE OF SALINE WATERS,
W70-00447 05G

SUBSIDENCE(ATMOSPHERIC)
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

SUBSIDIES
THE USE OF SUBSIDIES FOR WASTE ABATEMENT,
W70-00488 05G

MEASURING BENEFITS OF GOVERNMENT INVESTMENTS.
W70-00622 06B

THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

SUDAN
MICRO-IRRIGATION BY CATCHMENT TANK,
W70-00701 03B

SURFACE DRAINAGE
RIGHTS OF WAY FOR DRAINAGE.
W70-00775 04A

SURFACE RUNOFF
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 7 RIGHTS IN DISPOSAL OF DIFFUSED SURFACE WATER,
W70-00534 06E

REAL PROPERTY DISPOSITION OF DIFFUSED SURFACE WATERS IN NORTH CAROLINA,
W70-00561 04A

SURFACE WATERS
WATER RESOURCES OF RANDOLPH AND LAWRENCE COUNTIES, ARKANSAS,
W70-00420 02E

INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
W70-00422 02J

AN ORIENTATION STUDY OF THE URANIUM DISTRIBUTION IN LAKE WATERS, BEAVERLODGE DISTRICT, SASKATCHEWAN,
W70-00423 02H

SURFACE WATER AND RELATED CLIMATE FEATURES OF THE SAHIL SUSAH AREA, TUNISIA,
W70-00471 02E

HYDROLOGIC DATA FOR THE OAK RIDGE AREA, TENNESSEE,
W70-00476 02E

PROPERTY RIGHTS OF RIPARIAN OWNER IN MISSOURI WITH RESPECT TO OBSTRUCTION OF A NATURAL OR ARTIFICIAL WATERCOURSE,
W70-00525 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 5 CONSUMPTIVE USE OF WATER COMMON LAW RULES,
W70-00532 06E

REAL PROPERTY DISPOSITION OF DIFFUSED SURFACE WATERS IN NORTH CAROLINA,
W70-00561 04A

CHEMICAL QUALITY OF STREAMS IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00688 02K

SURFACE WATER IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00689 02E

WATER SUPPLY, USE AND MANAGEMENT,
W70-00706 04B

COMMON LAW RIGHTS TO SURFACE WATERS,
W70-00799 04A

SURGES
THREE-DIMENSIONAL SURGES AND RECOVERIES IN A NUMERICAL GLACIER MODEL,
W70-00443 02C

SURVEYING INSTRUMENTS
MEASURING ANGLES WITH A CARPENTER'S FOLDING RULER,
W70-00760 07B

SURVEYS
RESULTS OF SUBSURFACE EXPLORATION IN THE MID-ISLAND AREA OF WESTERN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
W70-00455 02F

GROUNDWATER RECONNAISSANCE IN THE BURNT RIVER VALLEY AREA, OREGON,
W70-00468 02F

CORRELATION AND ANALYSIS OF WATER-TEMPERATURE DATA FOR OREGON STREAMS,
W70-00470 02E

AVAILABILITY OF GROUND WATER IN YORK COUNTY, NEBRASKA,
W70-00472 02F

SOME METEOROLOGICAL REQUIREMENTS IN WATERSHED ENGINEERING RESEARCH,
W70-00474 07A

HYDROLOGIC DATA FOR THE OAK RIDGE AREA, TENNESSEE,
W70-00476 02E

IMPLICATIONS OF THE MINOR ELEMENT CONTENT OF SOME MAJOR STREAMS OF THE WORLD,
W70-00478 02K

GROUNDWATER RESOURCES OF THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00687 02F

CHEMICAL QUALITY OF STREAMS IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00688 02K

SUSPENSION
FLUID DYNAMICS OF MULTIPHASE SYSTEMS,
W70-00469 02F

SYNOPTIC ANALYSIS
LAND USE ALONG A TROPICAL CLIMATIC BOUNDARY THE WALAWE GANGA BASIN OF CEYLON,
W70-00463 03B

SYSTEMS ANALYSIS
OPTIMUM ALLOCATION OF WATER RESOURCES BY MATHEMATICAL PROGRAMMING,
W70-00641 06A

COMPUTER-ORIENTED METHOD OF OPTIMIZING HYDROLOGIC MODEL PARAMETERS,
W70-00642 06A

TANKERS
OIL POLLUTION AND THE SEA THE SOURCES OF POLLUTION.
W70-00787 05B

TAXES
TAXATION AND THE DISPOSITION OF DEPRECIABLE ASSETS,
W70-00600 06C

TEMPERATURE
THE EFFECT OF TEMPERATURE ON THE ACUTE TOXICITY OF PHENOL TO RAINBOW TROUT IN HARD WATER,
W70-00746 05C

TENNESSEE
LIMESTONE HYDROLOGY IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
W70-00451 02F

HYDROLOGIC DATA FOR THE OAK RIDGE AREA, TENNESSEE,
W70-00476 02E

A LIMNOLOGICAL STUDY OF A TENNESSEE COLD SPRINGBROOK,
W70-00672 02I

RIPARIAN RIGHTS - RIGHT TO FOLLOW ACCRETIONS ACROSS FIXED BOUNDARY LINE.
W70-00803 04A

TENNESSEE RIVER
THE MOVEMENT FOR NEW WATER RIGHTS LAWS IN THE TENNESSEE VALLEY STATES,
W70-00577 06E

STREAM POLLUTION.
W70-00835 05G

TENNESSEE VALLEY AUTHORITY PROJECT
CURRENT LEGISLATION,
W70-00776 06E

TERRACING
ENGINEERING PHASES OF LAND TREATMENT RELATED TO INCREASING WATER-USE EFFICIENCY AND STORAGE EFFICIENCY RAINFALL,
W70-00448 04A

TERRITORIAL SEAS
THE TERRITORIAL SEA A QUEST FOR UNIFORMITY,
W70-00519 06E

TERRITORIAL WATERS
THE UNITED NATIONS AND MARINE RESOURCES,
W70-00783 06B

TEXAS
EQUAL FOOTING AND THE MARGINAL SEA,
W70-00804 04A

THE TEXAS WATER PLAN
INSTITUTIONAL FACTORS AND THE TEXAS WATER PLAN,
W70-00492 06B

THERMAL POLLUTION
THE EFFECTS OF THERMAL EFFLUENTS ON MARINE ORGANISMS,

W70-00747 05C

EFFECTS OF INTRODUCTION OF HEATED WATER ON STREAMS (IN GERMAN),
W70-00748 05C

THERMAL POWER PLANTS
EFFECTS OF INTRODUCTION OF HEATED WATER ON STREAMS (IN GERMAN),
W70-00748 05C

THERMAL STRATIFICATION
THERMAL STRATIFICATION IN THE ARCTIC OCEAN,
W70-00638 02C

THERMAL STRUCTURE
THERMAL STRATIFICATION IN THE ARCTIC OCEAN,
W70-00638 02C

THERMODYNAMICS
APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
W70-00679 04A

THORIUM RADIOISOTOPES
THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
W70-00434 02K

TIDAL MARSHES
ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
W70-00445 02J

ESTUARINE LAND OF NORTH CAROLINA LEGAL ASPECTS OF OWNERSHIP, USE, AND CONTROL,
W70-00565 06E

TIDELANDS IN SOUTH CAROLINA A STUDY IN THE LAW OF REAL PROPERTY,
W70-00782 06E

TIDES
APPLICATION OF THE SPECTRAL ANALYSIS METHOD TO THE PRE-ESTIMATION OF TIDES (IN RUSSIAN),
W70-00643 02L

TOXICITY
THE EFFECT OF TEMPERATURE ON THE ACUTE TOXICITY OF PHENOL TO RAINBOW TROUT IN HARD WATER,
W70-00746 05C

TRACE ELEMENTS
URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
W70-00424 02H

RADIOMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF SELENIUM USING 3, 3' -DIAMINOBENZIDINE AS THE INITIAL REAGENT,
W70-00460 05A

IMPLICATIONS OF THE MINOR ELEMENT CONTENT OF SOME MAJOR STREAMS OF THE WORLD,
W70-00478 02K

TRACERS
AN INEXPENSIVE METHOD FOR DETERMINING THE DIRECTION OF NATURAL FLOW OF GROUNDWATER,
W70-00635 02F

WATER BUDGET STUDIES IN KARST AQUIFERS,
W70-00676 02F

TRACTIONABILITY
TRACTIONABILITY STUDY FOR THE LAOTIAN PANHANDLE,
W70-00484 02G

TRADEOFFS
GOVERNMENT RESEARCH AND DEVELOPMENT PROGRAMS,
W70-00621 06B

TRANSPORTATION
COMMISSIONERS OF STEAMSHIP TERMINALS.
W70-00809 06E

CANALS AND WATERWAYS.
W70-00814 04A

TREATIES
UNITED STATES RIVER TREATIES,
W70-00518 06E

TREATMENT FACILITIES
POLLUTION OF WATERS OF THE STATE THE STREAM POLLUTION CONTROL BOARD OF THE STATE OF INDIANA.
W70-00579 05G

TREES
THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
W70-00765 02I

TRITIUM
TRITIUM IN THE ENVIRONMENT FROM NUCLEAR POWERPLANTS,
W70-00716 05B

TUBIFICIDS
ACCUMULATION OF DIELDRIN BY FISH AND SELECTED FISH-FOOD ORGANISMS,
W70-00714 05C

TURBIDITY CURRENTS
SEDIMENTARY FEATURES AND PENECONTEMPORANEOUS SLUMPING IN THE WAITEMATA GROUP, WHANGAPARAOA PENINSULA, NORTH AUCKLAND, NEW ZEALAND,
W70-00653 02J

UNDERWATER
DIRECT ILLUSTRATION OF ONE WAY SAND TRANSPORT BY TIDAL CURRENTS,
W70-00436 02J

A DIVERSIFIED PROGRAM FOR THE STUDY OF SHALLOW WATER SEARCHING AND MAPPING TECHNIQUES,
W70-00461 07B

UNITED NATIONS
THE UNITED NATIONS AND MARINE RESOURCES,
W70-00783 06B

OIL POLLUTION OF THE SEA THE INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION.
W70-00791 05G

UNITED STATES
UNITED STATES RIVER TREATIES,
W70-00518 06E

EMINENT DOMAIN--NAVIGATIONAL SERVITUDE--EFFECT ON EVALUATION OF PORT SITE PROPERTY,
W70-00545 06E

RIVER AND HARBOR IMPROVEMENTS.
W70-00696 04A

COMPENSATION FOR TAKING OF FLOWAGE EASEMENTS BY CONDEMNATION,
W70-00781 04A

OIL POLLUTION OF THE SEA UNITED STATES ACTION.
W70-00792 05G

UPPER MISSISSIPPI RIVER BASIN
THE FEDERAL COMPREHENSIVE SURVEYS,
W70-00511 06B

URANIUM RADIOISOTOPES
THE USE OF RADON-222 IN SURFACE WATERS IN GEOCHEMICAL PROSPECTING FOR URANIUM,
W70-00421 02J

AN ORIENTATION STUDY OF THE URANIUM DISTRIBUTION IN LAKE WATERS, BEAVERLODGE DISTRICT, SASKATCHEWAN,
W70-00423 02H

URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
W70-00424 02H

URBAN EFFECTS
A CLIMATOLOGICAL EVALUATION OF PRECIPITATION PATTERNS,
W70-00740 04C

URBAN RENEWAL
URBAN DESIGN STUDY OF THE HONOLULU WATERFRONT.
W70-00750 06B

URBANIZATION
A CLIMATOLOGICAL EVALUATION OF PRECIPITATION PATTERNS,
W70-00740 04C

USSR
OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
W70-00428 02K

ON THE GEOCHEMISTRY OF UPPER PALEOZOIC AND LOWER MESOZOIC SEDIMENTS OF THE NORTHERN PART OF THE CISVERKHOYANSK TROUGH (RUSSIAN),
W70-00429 02K

AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN LANDSCAPE-GEOMORPHOLOGICAL FACTORS AND SEDIMENT RUNOFF OF THE RIVERS OF THE WESTERN TRANSCAUCASUS (IN RUSSIAN),
W70-00656 02J

DETERMINATION OF DEPENDENCE BETWEEN FILTRATION CHARACTERISTICS OF DRAINAGE CANALS (IN RUSSIAN),
W70-00663 04A

GLACIATION OF THE RIVER BASINS OF THE LEFT TRIBUTARIES OF THE ALAZANI AND THE PIRIKITA ALAZANI (IN GEORGIAN),
W70-00669 02C

USUFRUCTUARY RIGHT
WATER--AS A SPECIES OF PRIVATE PROPERTY--THE ILLINOIS VIEW,
W70-00568 04A

IOWA WATER LAW PROBLEMS TO BE CONSIDERED.
W70-00573 06E

UTAH VALLEY
IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
W70-00627 03F

UTILITIES
IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
W70-00627 03F

UTILITY
OUTDOOR RECREATION,
W70-00623 06B

VALUE
RESOURCE QUALITY AND VALUE OF THE LANDSCAPE,
W70-00607 06G

VALUE-BASED RULES
RESEARCH GOALS AND PROGRESS TOWARD THEM,
W70-00619 05G

VARIABLE COSTS
PRODUCTION COST FACTOR IN RATE-MAKING,
W70-00602 06C

VEGETABLE CROPS
POWER, WATER AND FOOD FOR DESERT COASTS AN INTEGRATED SYSTEM FOR PROVIDING THEM,
W70-00694 03A

VEGETATION
REMOVAL OF VEGETATION FROM WATERCOURSES.
W70-00437 04A

THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
W70-00765 02I

VEGETATION ESTABLISHMENT
ESTABLISHMENT AND SURVIVAL OF SEVERAL GRASSES IN THE SAGEBRUSH TYPE, WEST-CENTRAL NEW MEXICO,
W70-00762 04D

VOLCANOES
SOME CHARACTERISTICS OF THE WATERS OF GEORGIAN MUD VOLCANOES (IN RUSSIAN),
W70-00670 02K

VOLUNTARY ORGANIZATIONS
DEVELOPING POSITIVE PUBLIC ATTITUDES FOR WATER RESOURCE DEVELOPMENT,
W70-00514 06B

WARM WATER FISHING
FISH AND FISHING AROUND TVA STEAM PLANTS.
W70-00749 05C

WASHINGTON
ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
W70-00419 02L

MUNICIPAL CORPORATIONS-WATERS AND WATERCOURSES-EMINENT DOMAIN-POLLUTION OF WATER AS A 'TAKING' OF PRIVATE PROPERTY,
W70-00520 05G

WASTE WATER DISPOSAL
THE USE OF SUBSIDIES FOR WASTE ABATEMENT,
W70-00488 05G

WASTE WATER(POLLUTION)
CHEMICAL INTERACTIONS OF WASTEWATER IN A SOIL ENVIRONMENT,
W70-00658 05D

CHEMICAL PROCESSING OF WASTEWATER FOR NUTRIENT REMOVAL,
W70-00680 05D

WATER ALLOCATION
REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

WATER ALLOCATION(POLICY)
EXTERNALITIES AND THE QUALITY OF AIR AND WATER,
W70-00490 05G

OPTIMUM ALLOCATION OF WATER RESOURCES BY MATHEMATICAL PROGRAMMING,
W70-00641 06A

LAWS OF FLORIDA GOVERNING WATER USE,
W70-00769 06D

NORTH CAROLINA AND OTHER ATLANTIC STATES,
W70-00770 06E

CURRENT DEVELOPMENTS IN GROUND WATER LAW.
W70-00774 04B

WATER BALANCE
EVAPOTRANSPIRATION CLIMATONOMY 1. A NEW APPROACH TO NUMERICAL PREDICTION OF MONTHLY EVAPOTRANSPIRATION, RUNOFF, AND SOIL MOISTURE STORAGE,
W70-00654 02D

WATER CHEMISTRY
URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
W70-00424 02H

OCEANIC CONCENTRATIONS OF RADIUM-228,
W70-00435 02K

THE EXCHANGE OF HYDROGEN ISOTOPES BETWEEN ICE AND WATER IN TEMPERATURE GLACIERS,
W70-00439 02K

EXPERIMENTAL DISSOLUTION OF CALCIUM, MAGNESIUM, AND STRONTIUM FROM RECENT BIOGENIC CARBONATES A MODEL OF DIAGENESIS,
W70-00444 02K

ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
W70-00445 02J

CHEMICAL INTERACTIONS OF WASTEWATER IN A SOIL ENVIRONMENT,
W70-00658 05D

SOME CHARACTERISTICS OF THE WATERS OF GEORGIAN MUD VOLCANOES (IN RUSSIAN),
W70-00670 02K

DIAGENESIS, CHEMICAL SEDIMENTS, AND THE MIXING OF NATURAL WATERS,
W70-00674 02K

WATER COMPANIES
IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
W70-00627 03F

WATER CONSERVATION
ENGINEERING PHASES OF LAND TREATMENT RELATED TO INCREASING WATER-USE EFFICIENCY AND STORAGE EFFICIENCY RAINFALL,
W70-00448 04A

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 13 A LOOK TO THE FUTURE,
W70-00540 04A

WATER CONVEYANCE
THE QANATS OF IRAN,
W70-00692 04B

WATER DEMAND
WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 1 INTRODUCTION,
W70-00528 06E

A FRESH APPROACH TO WATER LAW,
W70-00768 06B

LAWS OF FLORIDA GOVERNING WATER USE,
W70-00769 06D

WATER DISTRICTS
PUBLIC UTILITIES (PUBLIC WATER DISTRICTS).
W70-00816 06E

WATER LAW
THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
W70-00766 05G

WATER LEVEL FLUCTUATIONS
GROUND-WATER CONDITIONS IN MCMULLEN VALLEY, MARICOPA, YUMA AND YAVAPAI COUNTIES, ARIZONA,
W70-00426 02F

HYDROLOGIC EFFECTS OF THE EARTHQUAKE OF MARCH 27, 1964, OUTSIDE ALASKA,
W70-00467 02E

WATERS AND WATERCOURSES - EASEMENTS - IMPLIED DEDICATION OF FLOWAGE EASEMENT APPURTENANT TO A DAM,
W70-00802 04A

WATER LEVELS
STAGE-DISCHARGE CHARACTERISTICS OF A WEIR IN A SAND-CHANNEL STREAM,
W70-00418 02E

WATER MANAGEMENT
IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
W70-00627 03F

THE INTERACTION OF URBAN REDEVELOPMENT AND FLOOD PLAIN MANAGEMENT IN WATERLOO, IOWA,
W70-00752 06B

WATER MANAGEMENT(APPLIED)
WATER-RELATED RESEARCH FOR THE GREAT LAKES REGION,
W70-00433 02H

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 10 SINGLE PURPOSE AND MULTIPURPOSE WATER MANAGEMENT DISTRICTS,
W70-00537 06E

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00542 05G

OPTIMUM ALLOCATION OF WATER RESOURCES BY MATHEMATICAL PROGRAMMING,
W70-00641 06A

COORDINATION OF URBAN PLANNING AND FLOOD PLAIN DEVELOPMENT,
W70-00751 06B

WATER MEASUREMENT
AN EXPERIMENTAL IN SITU DENSITOMETER,
W70-00462 07B

WATER POLICY
INTERFERENCE WITH THE PUBLIC RIGHT OF NAVIGATION AND THE RIPARIAN OWNER'S CLAIM OF PRIVILEGE,
W70-00546 06E

A FRESH APPROACH TO WATER LAW,
W70-00768 06B

NORTH CAROLINA AND OTHER ATLANTIC STATES,
W70-00770 06E

WATER POLLUTION
PUBLIC VS. PRIVATE GOODS,
W70-00491 05G

MUNICIPAL CORPORATIONS-WATERS AND WATERCOURSES-EMINENT DOMAIN-POLLUTION OF WATER AS A 'TAKING' OF PRIVATE PROPERTY,
W70-00520 05G

LIABILITY OF LANDOWNERS FOR POLLUTION OF PERCOLATING WATERS,
W70-00521 05G

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 11 THE LAW AND ADMINISTRATION OF POLLUTION CONTROL IN FLORIDA,
W70-00538 06E

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00544 05G

COMMENT ON ECONOMY OF WATER QUALITY MANAGEMENT AND POLLUTION CONTROL,
W70-00613 05G

RESEARCH GOALS AND PROGRESS TOWARD THEM,
W70-00619 05G

SEWAGE FUNGUS ITS NATURE AND EFFECTS,
W70-00637 05C

OIL POLLUTION OF THE SEA.
W70-00786 05G

OIL POLLUTION OF THE SEA PRIVATE REMEDIES.
W70-00793 05G

STREAM POLLUTION.
W70-00835 05G

WATER POLLUTION CONTROL
THE ROLE OF MARINE SCIENCES IN THE MULTIPLE USES OF THE COASTAL ZONE OF LAKE ERIE AND LAKE SUPERIOR,
W70-00457 02L

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00543 05G

W70-00544 05G

POLLUTION OF WATERS OF STATE.
W70-00578 05G

POLLUTION OF WATERS OF THE STATE THE STREAM POLLUTION CONTROL BOARD OF THE STATE OF INDIANA.
W70-00579 05G

POLLUTION OF WATERS OF STATE.
W70-00580 05G

W70-00581 06E

COMMENT ON ECONOMY OF WATER QUALITY MANAGEMENT AND POLLUTION CONTROL,
W70-00613 05G

NEUTRALIZATION OF ACID MINE DRAINAGE,
W70-00662 05D

RECOVERY OF WASTE OIL USING FLOATING-TYPE SKIMMERS,
W70-00686 05D

OIL POLLUTION OF THE SEA THE INTERNATIONAL RESPONSE.
W70-00790 05G

OIL POLLUTION OF THE SEA THE INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION.
W70-00791 05G

OIL POLLUTION OF THE SEA UNITED STATES ACTION.
W70-00792 05G

OIL POLLUTION OF THE SEA THE EFFORTS OF THE OIL AND SHIPPING INDUSTRIES.
W70-00794 05G

OIL POLLUTION OF THE SEA CLEANING UP.
W70-00796 05D

WATER POLLUTION CONTROL ACT
POLLUTION OF WATERS OF STATE.
W70-00578 05G

W70-00581 06E

WATER POLLUTION EFFECTS
UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA,
W70-00430 05G

THE USE OF INVERTEBRATES IN A WATER QUALITY INVESTIGATION A BIOLOGICAL STUDY OF THE MIAMI RIVER, OHIO,
W70-00475 05C

THE USE OF ARTIFICIAL SUBSTRATES IN POLLUTION SURVEYS,
W70-00666 05B

POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
W70-00709 05C

BACTERIOLOGICAL EFFECT OF SMALL BOAT WASTES ON SMALL HARBORS,
W70-00722 05C

ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
W70-00730 05G

EFFECTS OF INTRODUCTION OF HEATED WATER ON STREAMS (IN GERMAN),
W70-00748 05C

OIL POLLUTION OF THE SEA THE EFFECTS OF POLLUTION.
W70-00789 05C

WATER POLLUTION SOURCES
UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA,
W70-00430 05G

NITROGEN CONTAMINATION OF GROUNDWATER BY BARNYARD LEACHATES,
W70-00665 05B

OIL POLLUTION AND THE SEA THE SOURCES OF POLLUTION.
W70-00787 05B

OIL POLLUTION OF THE SEA DETECTION.
W70-00795 05A

WATER POLLUTION TREATMENT
MECHANICAL RETRIEVAL OF WASTE OILS AND SOLIDS FROM WATER,
W70-00685 05D

WATER QUALITY
ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
W70-00419 02L

UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA,
W70-00430 05G

THE USE OF INVERTEBRATES IN A WATER QUALITY INVESTIGATION A BIOLOGICAL STUDY OF THE MIAMI RIVER, OHIO,
W70-00475 05C

PANEL DISCUSSION ON WATER QUALITY CONTROL,
W70-00502 06B

PANEL DISCUSSION ON WATER QUALITY,
W70-00504 06B

W70-00505 06B

WATER QUALITY OBJECTIVES,
W70-00506 06B

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00543 05G

CHEMICAL QUALITY OF STREAMS IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00688 02K

EFFECTS OF FERTILIZERS ON WATER QUALITY.
W70-00717 05C

WATER QUALITY BENEFITS
ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
W70-00730 05G

WATER QUALITY CONTROL
WATER POLLUTION CONTROL ACT.
W70-00806 05G

WATER RATE DIFFERENTIALS
PRODUCTION COST FACTOR IN RATE-MAKING,
W70-00602 06C

WATER RATES
PRODUCTION COST FACTOR IN RATE-MAKING,
W70-00602 06C

WATER REQUIREMENTS
STRUCTURE OF THE ARIZONA ECONOMY OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
W70-00697 06B

WATER RESOURCE ALLOCATION
OPTIMAL WATER ALLOCATION THE NORTH PLATTE RIVER,
W70-00629 06D

WATER RESOURCE DEVELOPMENT
COST ALLOCATION IN RELATION TO WESTERN WATER POLICIES,
W70-00633 06C

WATER RESOURCES
ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
W70-00419 02L

WATER RESOURCES OF RANDOLPH AND LAWRENCE COUNTIES, ARKANSAS,
W70-00420 02E

RESULTS OF SUBSURFACE EXPLORATION IN THE MID-ISLAND AREA OF WESTERN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
W70-00455 02F

GROUNDWATER RESOURCES OF MONMOUTH COUNTY, NEW JERSEY,
W70-00465 02F

GROUNDWATER RECONNAISSANCE IN THE BURNT RIVER VALLEY AREA, OREGON,
W70-00468 02F

AVAILABILITY OF GROUND WATER IN YORK COUNTY, NEBRASKA,
W70-00472 02F

HYDROLOGIC DATA FOR THE OAK RIDGE AREA, TENNESSEE,
W70-00476 02E

GROUNDWATER RESOURCES OF THE PASCAGOULA RIVER BASIN, MISSISSIPPI AND ALABAMA,

W70-00477 02F

WATER LAW AND ADMINISTRATION - THE FLORIDA EXPERIENCE,
W70-00527 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 1 INTRODUCTION,
W70-00528 06E

SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

PROBLEMS OF QUALITY AND QUANTITY IN THE MANAGEMENT OF THE LIVING RESOURCES OF THE SEA,
W70-00608 06G

WATER-RESOURCES ENGINEERING,
W70-00634 06D

GROUNDWATER RESOURCES OF THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00687 02F

WATER RESOURCES DEVELOPMENT
WATER-RELATED RESEARCH FOR THE GREAT LAKES REGION,
W70-00433 02H

THE ROLE OF MARINE SCIENCES IN THE MULTIPLE USES OF THE COASTAL ZONE OF LAKE ERIE AND LAKE SUPERIOR,
W70-00457 02L

OREGON STATE INTEREST AND VIEWPOINT IN RIVER BASIN PLANNING IN THE WILLAMETTE COMPREHENSIVE STUDY,
W70-00509 06E

THE FEDERAL COMPREHENSIVE SURVEYS,
W70-00511 06B

PLANNING FOR WATER RESOURCE DEVELOPMENT THE FORMULATION OF A STRATEGY,
W70-00512 06B

WATER RESOURCE INFORMATION FOR PLANNING AND MANAGEMENT,
W70-00515 06B

WATER LAW AND ADMINISTRATION - THE FLORIDA EXPERIENCE,
W70-00527 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 9 STATE ADMINISTRATION OF WATER RESOURCES IN FLORIDA,
W70-00536 06E

THE CHICAGO WATER DIVERSION CONTROVERSY,
W70-00554 04D

PUBLIC WORKS AND CERTAIN PUBLIC AUTHORITIES.
W70-00599 06E

REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

OPTIMUM ALLOCATION OF WATER RESOURCES BY MATHEMATICAL PROGRAMMING,
W70-00641 06A

THE WATER RESOURCES OF CHILE AN ECONOMIC METHOD FOR ANALYZING A KEY RESOURCE IN A NATION'S DEVELOPMENT,
W70-00699 06B

THE SONORAN DESERT ITS GEOGRAPHY, ECONOMY, AND PEOPLE,
W70-00700 06G

ANNUAL REPORT FISCAL YEAR 1968-69,
W70-00733 09D

THE ILLINOIS STATE PLANNING PROGRAM,
W70-00753 06B

ILLINOIS PLANNING STUDIES AND COORDINATING ACTIVITIES,
W70-00754 06B

A FRESH APPROACH TO WATER LAW,
W70-00768 06B

INTERSTATE COOPERATION IN RIVER BASIN DEVELOPMENT,
W70-00784 06B

FLOOD CONTROL ACT.
W70-00827 04A

W70-00828 04A

W70-00829 04A

WATER RESOURCES PLANNING
WATER RESOURCE INFORMATION FOR PLANNING AND MANAGEMENT,
W70-00515 06B

RESEARCH GOALS AND PROGRESS TOWARD THEM,
W70-00619 05G

THE ILLINOIS STATE PLANNING PROGRAM,
W70-00753 06B

ILLINOIS PLANNING STUDIES AND COORDINATING ACTIVITIES,
W70-00754 06B

WATER RESOURCES RESEARCH ADMINISTRATION
ANNUAL REPORT FISCAL YEAR 1968-69,
W70-00733 09D

WATER RIGHTS
REAL PROPERTY--EASEMENTS--CONSTRUCTION OF INSTRUMENT GRANTING RIGHT OF FLOWAGE,
W70-00548 04A

WATER--AS A SPECIES OF PRIVATE PROPERTY--THE ILLINOIS VIEW,
W70-00568 04A

THE MOVEMENT FOR NEW WATER RIGHTS LAWS IN THE TENNESSEE VALLEY STATES,
W70-00577 06E

WATER SHORTAGE
WATER FOR PEOPLE,
W70-00756 06B

WATER SOFTENING
ECONOMIC EFFECTS OF USING SUBSTANDARD QUALITY WATER IN WEBSTER AND OTHER COMMUNITIES IN SOUTH DAKOTA.
W70-00727 03C

WATER SPORTS
WATER NAVIGATION REGULATIONS.
W70-00587 06E

WATER STORAGE
RUNOFF FROM SMALL PEATLAND WATERSHEDS,
W70-00675 02E

WATER SUPPLY
RESULTS OF SUBSURFACE EXPLORATION IN THE MID-ISLAND AREA OF WESTERN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
W70-00455 02F

SURFACE WATER AND RELATED CLIMATE FEATURES OF THE SAHIL SUSAH AREA, TUNISIA,
W70-00471 02E

DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00542 05G

IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
W70-00627 03F

THE PROPOSED SOLWAY FIRTH BARRAGES A REVIEW OF THE GEOLOGICAL AND GEOTECHNICAL ASPECTS,
W70-00646 04A

THE QANATS OF IRAN,
W70-00692 04B

POWER, WATER AND FOOD FOR DESERT COASTS AN INTEGRATED SYSTEM FOR PROVIDING THEM,
W70-00694 03A

WATER SUPPLY, USE AND MANAGEMENT,
W70-00706 04B

ECONOMIC EFFECTS OF USING SUBSTANDARD QUALITY WATER IN WEBSTER AND OTHER COMMUNITIES IN SOUTH DAKOTA.
W70-00727 03C

WATER TEMPERATURE
CORRELATION AND ANALYSIS OF WATER-TEMPERATURE DATA FOR OREGON STREAMS,
W70-00470 02E

APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
W70-00679 04A

SEASONAL SELECTION OF ESTUARINE BACTERIA BY WATER TEMPERATURE,
W70-00713 05C

PATTERNS OF THE THERMAL REGIME OF THE SURFACE LAYER OF WATER,
W70-00741 02D

WATER UTILITIES
CREDIT AND COLLECTION POLICIES AT EUGENE, OREGON,
W70-00597 06C

WATER UTILIZATION
SURFACE-WATER RESOURCES OF THE YOBE RIVER SYSTEM, NORTHERN NIGERIA, 1963-68,
W70-00456 02A

AGRICULTURAL METEOROLOGY IN ISRAEL,
W70-00691 03F

THE WATER RESOURCES OF CHILE AN ECONOMIC METHOD FOR ANALYZING A KEY RESOURCE IN A NATION'S DEVELOPMENT,
W70-00699 06B

WATER SUPPLY, USE AND MANAGEMENT,
W70-00706 04B

FRONTIER TOWN PROPERTIES, INC V STATE (CONDEMNATION VALUE OF WATER USE).
W70-00805 06C

WATER VALUES
STRUCTURE OF THE ARIZONA ECONOMY OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
W70-00697 06B

WATER WORKS

CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

PUBLIC UTILITIES (PUBLIC WATER DISTRICTS).
W70-00816 06E

WATER YIELD
APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
W70-00679 04A

WATER YIELD IMPROVEMENT
MICRO-IRRIGATION BY CATCHMENT TANK,
W70-00701 03B

WATERCOURSES(LEGAL)
CONOBRE V FRITSCH (NATURAL WATERCOURSES).
W70-00720 04A

WATERLOO
THE INTERACTION OF URBAN REDEVELOPMENT AND FLOOD PLAIN MANAGEMENT IN WATERLOO, IOWA,
W70-00752 06B

WATERSHED MANAGEMENT
SUCCESS OF WATERSHED DEVELOPMENT IN LOCAL COMMUNITIES,
W70-00497 06B

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 8 FEDERAL AUTHORITY AND ACTIVITY AFFECTING FLORIDA'S WATER RESOURCES,
W70-00535 06E

SNOWPACK MANAGEMENT,
W70-00763 02C

WATERSHEDS
OPERATIONAL PROCEDURES FOR EVALUATING FLOOD PROTECTION BENEFITS,
W70-00625 06F

WATERSHEDS(BASINS)
AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN LANDSCAPE-GEOMORPHOLOGICAL FACTORS AND SEDIMENT RUNOFF OF THE RIVERS OF THE WESTERN TRANSCAUCASUS (IN RUSSIAN),
W70-00656 02J

RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
W70-00698 02E

WEATHER MODIFICATION
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

WELFARE ECONOMICS
RESEARCH GOALS AND PROGRESS TOWARD THEM,
W70-00619 05G

WEST PAKISTAN
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

WEST VIRGINIA
THE LAW OF NAVIGABLE STREAMS IN WEST VIRGINIA,
W70-00576 06E

APPEAL TO WATER RESOURCES BOARD.
W70-00734 06E

CONSTITUTIONAL LAW-NAVIGABLE WATERS-EXTENSION OF THE FEDERAL PREROGATIVE,
W70-00801 04A

WATER POLLUTION CONTROL ACT.
W70-00806 05G

HUNTING AND FISHING LICENSES.
W70-00807 06E

WESTERN U
THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
W70-00693 06B

WILDLIFE
FISH AND GAME.
W70-00588 06E

OIL POLLUTION OF THE SEA THE EFFECTS OF POLLUTION.
W70-00789 05C

WILDLIFE CONSERVATION
POWERS AND DUTIES OF THE DIRECTOR OF THE DIVISION OF FISH AND GAME AND OF GAME WARDENS.
W70-00431 06E

WISCONSIN
SELECTED WATER RESOURCES INDEX FOR WISCONSIN,
W70-00767 10

WORKING ENVIRONMENT
ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
W70-00730 05G

WORKPLAN
OPERATIONAL PROCEDURES FOR EVALUATING FLOOD PROTECTION BENEFITS,
W70-00625 06F

YARDSTICK
COST ALLOCATION IN RELATION TO WESTERN WATER POLICIES,
W70-00633 06C

AUTHOR INDEX

ACKERMAN, WILLIAM C.
COST OF MUNICIPAL SEWAGE TREATMENT,
W70-00493 05D

ALIYEV, AD. A.
SOME CHARACTERISTICS OF THE WATERS OF GEORGIAN MUD VOLCANOES (IN RUSSIAN),
W70-00670 02K

ANDERSON, HENRY W.
SNOWPACK MANAGEMENT,
W70-00763 02C

ANDREWS, PETER B.
ENVIRONMENTALLY SIGNIFICANT SEDIMENTOLOGIC CHARACTERISTICS OF BEACH SANDS,
W70-00650 02L

ARCHER, R. J.
A RECONNAISSANCE OF STREAM SEDIMENT IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00466 02J

CHEMICAL QUALITY OF STREAMS IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00688 02K

ARNASON, BRAGI
THE EXCHANGE OF HYDROGEN ISOTOPES BETWEEN ICE AND WATER IN TEMPERATURE GLACIERS,
W70-00439 02K

ARTHUR, JOHN W.
THE USE OF ARTIFICIAL SUBSTRATES IN POLLUTION SURVEYS,
W70-00666 05B

AYCOCK, WILLIAM P.
REAL PROPERTY DISPOSITION OF DIFFUSED SURFACE WATERS IN NORTH CAROLINA,
W70-00561 04A

BAERREIS, DAVID A.
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

BAKER, SIMON
LAND USE ALONG A TROPICAL CLIMATIC BOUNDARY THE WALAWE GANGA BASIN OF CEYLON,
W70-00463 03B

BALDWIN, F.
WATER LAW AND ADMINISTRATION - THE FLORIDA EXPERIENCE,
W70-00527 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 1 INTRODUCTION,
W70-00528 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 2 RIGHTS IN DEFINED WATERBODIES BASIC CONSIDERATIONS,
W70-00529 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 3 OWNERSHIP OF UPLAND AS THE SOURCE OF RIPARIAN RIGHTS,
W70-00530 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 4 NONCONSUMPTIVE USES OF NATURAL NAVIGABLE WATERBODIES,
W70-00531 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 5 CONSUMPTIVE USE OF WATER COMMON LAW RULES,
W70-00532 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 6 STATUTORY MODIFICATIONS OF EASTERN CONSUMPTIVE USE DOCTRINES,
W70-00533 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 7 RIGHTS IN DISPOSAL OF DIFFUSED SURFACE WATER,
W70-00534 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 8 FEDERAL AUTHORITY AND ACTIVITY AFFECTING FLORIDA'S WATER RESOURCES,
W70-00535 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 9 STATE ADMINISTRATION OF WATER RESOURCES IN FLORIDA,
W70-00536 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 10 SINGLE PURPOSE AND MULTIPURPOSE WATER MANAGEMENT DISTRICTS,
W70-00537 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 11 THE LAW AND ADMINISTRATION OF POLLUTION CONTROL IN FLORIDA,
W70-00538 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 12 TITLE TO BEDS UNDER NAVIGABLE WATERS,
W70-00539 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 13 A LOOK TO THE FUTURE,
W70-00540 04A

BARNETT, HAROLD J.
PRESSURES OF GROWTH UPON ENVIRONMENT,
W70-00618 06G

BARTKE, RICHARD W.
THE NAVIGATION SERVITUDE AND JUST COMPENSATION--STRUGGLE FOR A DOCTRINE,
W70-00559 04A

BASS, GEORGE F.
A DIVERSIFIED PROGRAM FOR THE STUDY OF SHALLOW WATER SEARCHING AND MAPPING TECHNIQUES,
W70-00461 07B

BAY, ROGER R.
RUNOFF FROM SMALL PEATLAND WATERSHEDS,
W70-00675 02E

BEALL, R. M.
SURFACE WATER IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00689 02E

BECK, ROBERT E.
THE WANDERING MISSOURI RIVER A STUDY IN ACCRETION LAW,
W70-00777 06E

W70-00778 06E

W70-00779 06E

W70-00780 06E

BELDERSON, ROBERT H.
DIRECT ILLUSTRATION OF ONE WAY SAND TRANSPORT BY TIDAL CURRENTS,
W70-00436 02J

BENSON, DONALD J.
PANEL DISCUSSION ON WATER QUALITY,
W70-00504 06B

BENSON, M. A.
GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
W70-00440 02E

BEVERAGE, JOSEPH P.
ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
W70-00419 02L

BINGHAM, R. H.
LIMESTONE HYDROLOGY IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
W70-00451 02F

BLOOMSBURG, G. L.
HYDROLOGY OF FROZEN GROUND FLOODS,
W70-00721 02C

BOELTER, D. H.
PHYSICAL PROPERTIES OF PEATS AS RELATED TO DEGREE OF DECOMPOSITION,
W70-00761 02G

BOWER, LEONARD G.
STRUCTURE OF THE ARIZONA ECONOMY OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
W70-00697 06B

BOYKIN, J. C.
VERTICAL DISTRIBUTION OF PHOSPHORUS IN LINSLEY POND MUD,
W70-00712 02H

BREHMER, M. L.
THE EFFECTS OF THERMAL EFFLUENTS ON MARINE ORGANISMS,
W70-00747 05C

BREWER, MICHAEL F.
FEDERAL NATURAL RESOURCES DEVELOPMENT BASIC ISSUES IN BENEFIT AND COST MEASUREMENT,
W70-00494 06B

RESOURCE QUALITY NEW DIMENSIONS AND PROBLEMS FOR PUBLIC POLICY,
W70-00612 06A

BRIGGS, P. C.
GROUND-WATER CONDITIONS IN MCMULLEN VALLEY, MARICOPA, YUMA AND YAVAPAI COUNTIES, ARIZONA,
W70-00426 02F

BRIGHAM, EUGENE V.
COST OF CAPITAL TO THE SMALL FIRM,
W70-00616 06C

BROCKSEN, ROBERT W.
ACCUMULATION OF DIELDRIN BY FISH AND SELECTED FISH-FOOD ORGANISMS,
W70-00714 05C

BROWNING, DAVID S.
THE UNITED NATIONS AND MARINE RESOURCES,
W70-00783 06B

BROWN, J. E.
CREDIT AND COLLECTION POLICIES AT EUGENE, OREGON,
W70-00597 06C

BROWN, K. W.
RESEARCH IN EVAPOTRANSPIRATION,
W70-00450 02D

BROWN, M. C.
WATER BUDGET STUDIES IN KARST AQUIFERS,
W70-00676 02F

BROWN, V. M.
THE EFFECT OF TEMPERATURE ON THE ACUTE TOXICITY OF PHENOL TO RAINBOW TROUT IN HARD WATER,
W70-00746 05C

BRYSON, REID A.
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

BURCHETT, C. R.
LIMESTONE HYDROLOGY IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
W70-00451 02F

CALDWELL, LYNTON K.
INTERSTATE COOPERATION IN RIVER BASIN DEVELOPMENT,
W70-00784 06B

CAMPBELL, THOMAS H.
PHYSICAL INFLUENCES ON FLOW SERIAL CORRELATION,
W70-00723 02E

CAMPBELL, WILLIAM J.
THREE-DIMENSIONAL SURGES AND RECOVERIES IN A NUMERICAL GLACIER MODEL,
W70-00443 02C

CASTLE, EMORY
SOME OBSERVATIONS ON ECONOMIC EVALUATION STUDIES,
W70-00499 06C

CHADWICK, GEORGE G.
ACCUMULATION OF DIELDRIN BY FISH AND SELECTED FISH-FOOD ORGANISMS,
W70-00714 05C

CHALEIL, J.
APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
W70-00679 04A

CHANGNON, J. P., JR.
A CLIMATOLOGICAL EVALUATION OF PRECIPITATION PATTERNS,
W70-00740 04C

CHANG, T. P.
STATISTICAL ANALYSIS OF MEANDERING RIVER GEOMETRY,
W70-00725 02E

CHASE, SAMUEL B.
ASSET PRICES IN ECONOMIC ANALYSIS,
W70-00626 06C

CHERRY, R. D.
THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
W70-00434 02K

CHILTON, H.
PERFORMANCE OF NATURAL-DRAUGHT WATER COOLING TOWERS,
W70-00745 05D

CHRISTODOULOU, A. P.
PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
W70-00726 03A

CIRACY-WANTRUP, S. V.
COST ALLOCATION IN RELATION TO WESTERN WATER POLICIES,
W70-00633 06C

CLAVERIE, PHILIP
REAL PROPERTY--ALLUVION AND ACCRETION--ARTICLE 509 OF THE LOUISIANA CIVIL CODE,
W70-00560 06E

CLYNE, ROBERT W.
MECHANICAL RETRIEVAL OF WASTE OILS AND SOLIDS FROM WATER,
W70-00685 05D

COLSON, B. E.
SURFACE-WATER RESOURCES OF THE YOBE RIVER SYSTEM, NORTHERN NIGERIA, 1963-68,
W70-00456 02A

CORCORAN, E. F.
THE UPTAKE, ACCUMULATION AND EXCHANGE OF STRONTIUM-90 BY OPEN SEA PHYTOPLANKTON,
W70-00707 05C

CORDONE, ALMO J.
OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
W70-00711 02H

CORONTZOS, ROBERT
COMPENSATION FOR TAKING OF FLOWAGE EASEMENTS BY CONDEMNATION,
W70-00781 04A

COTNER, MELVIN L.
RESEARCH PERSPECTIVE FOR SOCIOLOGICAL PROBLEMS INVOLVING WATER RESOURCES,
W70-00755 06B

COX, P. THOMAS
SUCCESS OF WATERSHED DEVELOPMENT IN LOCAL COMMUNITIES,
W70-00497 06B

CRABTREE, BROOKS F.
MUNICIPAL CORPORATIONS-WATERS AND WATERCOURSES-EMINENT DOMAIN-POLLUTION OF WATER AS A 'TAKING' OF PRIVATE PROPERTY,
W70-00520 05G

CREASI, VINCENT J.
AN ANNOTATED CLIMATOLOGICAL BIBLIOGRAPHY OF ROMANIA,
W70-00482 10

CRIBBET, JOHN E.
WATER--AS A SPECIES OF PRIVATE PROPERTY--THE ILLINOIS VIEW,
W70-00568 04A

CROZIER, M. J.
EARTHFLOW OCCURRENCE DURING HIGH INTENSITY RAINFALL IN EASTERN OTAGO (NEW ZEALAND),
W70-00647 02B

CRUTCHFIELD, JAMES A.
SOME PROBLEMS IN EVALUATION OF WATER RESOURCES,
W70-00500 06C

CULBERTSON, J. K.
STAGE-DISCHARGE CHARACTERISTICS OF A WEIR IN A SAND-CHANNEL STREAM,
W70-00418 02E

CURTIS, E. J. C.
SEWAGE FUNGUS ITS NATURE AND EFFECTS,
W70-00637 05C

DASMANN, RAYMOND F.
AN ENVIRONMENT FIT FOR PEOPLE,
W70-00603 06G

DAVIDSON, DONALD W.
THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
W70-00765 02I

DAVIS, CLARENCE A.
FEDERAL ENCROACHMENT ON STATE WATER RIGHTS,
W70-00549 06E

DAVIS, OTTO A.
EXTERNALITIES AND THE QUALITY OF AIR AND WATER,
W70-00490 05G

DECOURSEY, DONN G.
COMPUTER-ORIENTED METHOD OF OPTIMIZING HYDROLOGIC MODEL PARAMETERS,
W70-00642 06A

DEGAN, ARIOSTO
SPRINKLER IRRIGATION,
W70-00695 03F

DENNER, W.
THERMAL STRATIFICATION IN THE ARCTIC OCEAN,
W70-00638 02C

DI LUZIO, FRANK C.
WATER USE AND THERMAL POLLUTION,
W70-00742 05C

DIONNE, JEAN-CLAUDE
TIDAL FLAT EROSION BY ICE AT LA POCATIERE, ST. LAWRENCE ESTUARY,
W70-00640 02L

DIXEY, F.
WATER SUPPLY, USE AND MANAGEMENT,
W70-00706 04B

DMITRIEV, A. A.
THE USE OF EXPONENTIAL FUNCTIONS WHEN CONSTRUCTING THE LAWS OF THE DISTRIBUTION OF GEOGRAPHICAL AND HYDROMETEOROLOGICAL PARAMETERS (IN RUSSIAN),
W70-00657 02A

DOBBINS, DONALD V.
ILLINOIS DRAINAGE LAW (A COMMENTARY),
W70-00815 04A

DODGE, ROY T.
THE FEDERAL COMPREHENSIVE SURVEYS,
W70-00511 06B

DORAISWAMY, P. C.
RESEARCH IN EVAPOTRANSPIRATION,
W70-00450 02D

DREESZEN, V. H.
AVAILABILITY OF GROUND WATER IN YORK COUNTY, NEBRASKA,
W70-00472 02F

DRESS, W.
EFFICIENCY IN GOVERNMENT SPENDING,
W70-00615 06B

DUNBIER, ROGER
THE SONORAN DESERT ITS GEOGRAPHY, ECONOMY, AND PEOPLE,
W70-00700 06G

DURUM, W. H.
IMPLICATIONS OF THE MINOR ELEMENT CONTENT OF SOME MAJOR STREAMS OF THE WORLD,
W70-00478 02K

DUTCHER, L. C.
SURFACE WATER AND RELATED CLIMATE FEATURES OF THE SAHIL SUSAH AREA, TUNISIA,
W70-00471 02E

DWORSKY, LEONARD
MAKING THE STATE AN EFFECTIVE PARTNER IN WATER DEVELOPMENT,
W70-00513 06B

DYCK, WILLY
THE USE OF RADON-222 IN SURFACE WATERS IN GEOCHEMICAL PROSPECTING FOR URANIUM,
W70-00421 02J

DZVELAYA, M. P.
SOME CHARACTERISTICS OF THE WATERS OF GEORGIAN MUD VOLCANOES (IN RUSSIAN),
W70-00670 02K

ECKOLDT, M.
EFFECTS OF INTRODUCTION OF HEATED WATER ON STREAMS (IN GERMAN),
W70-00748 05C

EDELMAN, SIDNEY
FEDERAL AIR AND WATER CONTROL THE APPLICATION OF THE COMMERCE POWER TO ABATE INTERSTATE AND INTRASTATE POLLUTION,
W70-00771 05G

ELDBLOM, LARS
NOTES ON PROBLEMS OF IRRIGATION IN THREE LIBYAN OASES,
W70-00703 04B

ELIASSEN, ROLF
CHEMICAL PROCESSING OF WASTEWATER FOR NUTRIENT REMOVAL,
W70-00680 05D

EMERY, P. A.
AVAILABILITY OF GROUND WATER IN YORK COUNTY, NEBRASKA,
W70-00472 02F

EVANS, ALVIN E.
RIPARIAN RIGHTS IN ARTIFICIAL LAKES AND STREAMS,
W70-00797 04A

EVANS, HUGH C.
IRRIGATION IN KENTUCKY AS AFFECTED BY THE LAW OF RIPARIAN RIGHTS,
W70-00571 03F

FALKSON, LOUIS MICHAEL
COMMENT ON ECONOMY OF WATER QUALITY MANAGEMENT AND POLLUTION CONTROL,
W70-00613 05G

FARNESS, SANFORD S.
PERSPECTIVES ON ENVIRONMENTAL PLANNING AND RESOURCE DEVELOPMENT,
W70-00510 06B

FITZGERALD, GEORGE P.
THE ISOLATION, PURIFICATION, AND NUTRIENT SOLUTION REQUIREMENTS OF BLUE-GREEN ALGAE,
W70-00719 05C

FLANDERS, A. F.
HYDROLOGICAL REQUIREMENTS FOR WEATHER RADAR DATA,
W70-00673 02B

FLEMING, P.M.
RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
W70-00698 02E

FORD, D. C.
WATER BUDGET STUDIES IN KARST AQUIFERS,
W70-00676 02F

FRANTZ, TED C.
OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
W70-00711 02H

FRANZINI, JOSEPH B.
WATER-RESOURCES ENGINEERING,
W70-00634 06D

FREEMAN, R. M.
THE MOVEMENT FOR NEW WATER RIGHTS LAWS IN THE TENNESSEE VALLEY STATES,
W70-00577 06E

FREUND, R. A.
OPERATIONAL PROCEDURES FOR EVALUATING FLOOD PROTECTION BENEFITS,
W70-00625 06F

FRIEDEL, R. A.
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

FRYE, JOHN C.
WATER RESOURCE INFORMATION FOR PLANNING AND MANAGEMENT,
W70-00515 06B

GEMMELL, ROBERT S.
COMMENT ON THE PLACE OF WATER RESOURCES PLANNING IN ECONOMIC REGIONAL DEVELOPMENT,
W70-00614 06B

GEMMELL, R. S.
PRODUCTION COST FACTOR IN RATE-MAKING,
W70-00602 06C

GERICKE, I. H.
THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
W70-00434 02K

GERLOFF, GERALD C.
THE ISOLATION, PURIFICATION, AND NUTRIENT SOLUTION REQUIREMENTS OF BLUE-GREEN ALGAE,
W70-00719 05C

GERMANOV, A. I.
OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
W70-00428 02K

GILBERT, B. K.
SURFACE WATER IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00689 02E

GILLHAM, R. W.
NITROGEN CONTAMINATION OF GROUNDWATER BY BARNYARD LEACHATES,
W70-00665 05B

GINSBURG, R. N.
ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
W70-00445 02J

GLEASON, J. F.
CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

GOERLITZ, DONALD F.
DETERMINATION OF PHENOXY ACID HERBICIDES IN WATER BY ELECTRON-CAPTURE AND MICROCOULOMETRIC GAS CHROMATOGRAPHY,
W70-00473 05A

GOETZ, CHARLES
PUBLIC VS. PRIVATE GOODS,
W70-00491 05G

GOLDIE, L. F. E.
SEDENTARY FISHERIES AND ARTICLE 2(4) OF THE CONVENTION ON THE CONTINENTAL SHELF - A PLEA FOR A SEPARATE REGIME,
W70-00772 06E

GONZALEZ, D. D.
STAGE-DISCHARGE CHARACTERISTICS OF A WEIR IN A SAND-CHANNEL STREAM,
W70-00418 02E

GORDON, KENNETH E., JR.
CIVIL LAW PROPERTY--ALLUVION DISTINGUISHING LAKES FROM RIVERS AND STREAMS,
W70-00541 04D

GOUDEY, RAY F.
DEVELOPING STANDARDS FOR THE PROTECTION OF GROUND WATER,
W70-00542 05G

W70-00543 05G

W70-00544 05G

GRAVES, GENE H.
ILLINOIS PLANNING STUDIES AND COORDINATING ACTIVITIES,
W70-00754 06B

GREGORY, M. R.
SEDIMENTARY FEATURES AND PENECONTEMPORANEOUS SLUMPING IN THE WAITEMATA GROUP, WHANGAPARAOA PENINSULA, NORTH AUCKLAND, NEW ZEALAND,
W70-00653 02J

HAFFTY, JOSEPH
IMPLICATIONS OF THE MINOR ELEMENT CONTENT OF SOME MAJOR STREAMS OF THE WORLD,
W70-00478 02K

HAJEK, B. F.
CHEMICAL INTERACTIONS OF WASTEWATER IN A SOIL ENVIRONMENT,
W70-00658 05D

HALES, T. A.
RESEARCH IN EVAPOTRANSPIRATION,
W70-00450 02D

HANNA, PAUL A.
PROPERTY RIGHTS OF RIPARIAN OWNER IN MISSOURI WITH RESPECT TO OBSTRUCTION OF A NATURAL OR ARTIFICIAL WATERCOURSE,
W70-00525 06E

HANSON, LARRY G.
CHARACTERISTICS OF COLUMBIA RIVER SEDIMENT AND SEDIMENT TRANSPORT,

W70-00446 02J

HARDING, W. E.
SURFACE WATER IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00689 02E

HARWARD, ERNEST D.
TRITIUM IN THE ENVIRONMENT FROM NUCLEAR POWERPLANTS,
W70-00716 05B

HASTINGS, V. S.
OPTIMAL WATER ALLOCATION THE NORTH PLATTE RIVER,
W70-00629 06D

HAVEMAN, ROBERT H.
FEDERAL NATURAL RESOURCES DEVELOPMENT BASIC ISSUES IN BENEFIT AND COST MEASUREMENT,
W70-00494 06B

HAVLICK, SPENSER W.
WATER-RELATED RESEARCH FOR THE GREAT LAKES REGION,
W70-00433 02H

HEADLEY, J. C.
REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

HEANEY, J. P.
PRODUCTION COST FACTOR IN RATE-MAKING,
W70-00602 06C

HEATH, M. S., JR.
THE MOVEMENT FOR NEW WATER RIGHTS LAWS IN THE TENNESSEE VALLEY STATES,
W70-00577 06E

HEIDEMAN, KENNETH F.
A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH VALIDITY TESTING OF A COMPARATIVE-PROJECTOR MODEL,
W70-00479 06A

HELLEY, EDWARD J.
OPTICAL METHOD FOR DETERMINING PARTICLE SIZES OF COARSE SEDIMENT,
W70-00655 02J

HENKEL, DONALD E.
GEOLOGY OF THE REGOLITH AQUIFERS OF THE NISHNABOTNA BASIN,
W70-00458 02F

HERBST, RICHARD P.
ECOLOGICAL FACTORS AND THE DISTRIBUTION OF CLADOPHORA GLOMERATA IN THE GREAT LAKES,
W70-00667 05C

HERMAN, S. G.
POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
W70-00709 05C

HERSHFIELD, DAVID M.
SOME METEOROLOGICAL REQUIREMENTS IN WATERSHED ENGINEERING RESEARCH,
W70-00474 07A

HICKMAN, DANIEL G.
APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
W70-00636 07B

HILLYARD, HAROLD E.
RECOVERY OF WASTE OIL USING FLOATING-TYPE SKIMMERS,
W70-00686 05D

HILL, DAVID W.
NEUTRALIZATION OF ACID MINE DRAINAGE,
W70-00662 05D

HILL, PHILIP B.
THE LAW OF NAVIGABLE STREAMS IN WEST VIRGINIA,
W70-00576 06E

HINES, MARION S.
WATER RESOURCES OF RANDOLPH AND LAWRENCE COUNTIES, ARKANSAS,
W70-00420 02E

HINOTE, HUBERT
BENEFIT-COST ANALYSIS FOR WATER RESOURCE PROJECTS A SELECTED ANNOTATED BIBLIOGRAPHY,
W70-00495 06B

HODGES, CARL N.
POWER, WATER AND FOOD FOR DESERT COASTS AN INTEGRATED SYSTEM FOR PROVIDING THEM,
W70-00694 03A

HODGE, CARLE O.
POWER, WATER AND FOOD FOR DESERT COASTS AN INTEGRATED SYSTEM FOR PROVIDING THEM,
W70-00694 03A

HOGG, JOHN E.
APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
W70-00636 07B

HORNING, WILLIAM B., II.
THE USE OF ARTIFICIAL SUBSTRATES IN POLLUTION SURVEYS,
W70-00666 05B

HORSNAIL, R. F.
INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
W70-00422 02J

HOUCK, LEIGHTON S.
COMPENSATION FOR THE RIGHT OF ACCESS TO NAVIGABLE WATERS,
W70-00566 04A

HOWE, CHARLES W.
FEDERAL NATURAL RESOURCES DEVELOPMENT BASIC ISSUES IN BENEFIT AND COST MEASUREMENT,
W70-00494 06B

HUANG, JINN HUIE
PORE STUDIES OF HIGHLY INDURATED APPALACHIAN ROCKS,
W70-00659 02F

HUDSON, JAMES
IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
W70-00627 03F

HUEFNER, RONALD J.
TAXATION AND THE DISPOSITION OF DEPRECIABLE ASSETS,
W70-00600 06C

HUNTER, JOSEPH V.
CONTRIBUTION OF PHOTOSYNTHETIC REAERATION TO TOTAL REAERATION OF THE PASSAIC RIVER,
W70-00731 05B

HUNT, RICHARD H.
RIPARIAN RIGHTS IN FLORIDA,
W70-00555 06E

W70-00556 06E

W70-00557 06E

W70-00558 06E

HUSSEY, KEITH
GEOLOGY OF THE REGOLITH AQUIFERS OF THE NISHNABOTNA BASIN,
W70-00458 02F

IGNJATOVIC, LAZAR R.
EFFECT OF PHOTOSYNTHESIS ON OXYGEN SATURATION,
W70-00683 05C

IONIDES, M. G.
MICRO-IRRIGATION BY CATCHMENT TANK,
W70-00701 03B

JABLONSKI, LEO A.
GROUNDWATER RESOURCES OF MONMOUTH COUNTY, NEW JERSEY,
W70-00465 02F

JENSEN, CLARENCE W.
INSTITUTIONAL FACTORS AND THE TEXAS WATER PLAN,
W70-00492 06B

JERLOV, N. G.
OPTICAL OCEANOGRAPHY,
W70-00464 07B

JOHNSON, DONALD W.
PESTICIDES AND FISHES--A REVIEW OF SELECTED LITERATURE,
W70-00718 05C

JOHNSON, EUGENE O.
COORDINATION OF URBAN PLANNING AND FLOOD PLAIN DEVELOPMENT,
W70-00751 06B

JONES, BRIAN G.
SEDIMENTOLOGY OF THE WAITEMATA GROUP IN THE STANLEY POINT-DEVONPORT AREA, AUCKLAND, NEW ZEALAND,
W70-00652 02J

JONES, ORTON A.
CONSTITUTIONAL LAW-NAVIGABLE WATERS-EXTENSION OF THE FEDERAL PREROGATIVE,
W70-00801 04A

JORDAN, D. H. M.
THE EFFECT OF TEMPERATURE ON THE ACUTE TOXICITY OF PHENOL TO RAINBOW TROUT IN HARD WATER,
W70-00746 05C

KAMIEN, MORTON I.
EXTERNALITIES AND THE QUALITY OF AIR AND WATER,
W70-00490 05G

KAMMERER, J. C.
CHEMICAL QUALITY OF STREAMS IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00688 02K

KARR, MALCOLM H.
PANEL DISCUSSION ON WATER QUALITY CONTROL,
W70-00502 06B

KAY, J. A.
THE PROPOSED SOLWAY FIRTH BARRAGES A REVIEW OF THE GEOLOGICAL AND GEOTECHNICAL ASPECTS,
W70-00646 04A

KEECH, C. F.
AVAILABILITY OF GROUND WATER IN YORK COUNTY, NEBRASKA,
W70-00472 02F

KEENE, KENNETH L.
EMINENT DOMAIN--NAVIGATIONAL SERVITUDE--EFFECT ON EVALUATION

OF PORT SITE PROPERTY,
W70-00545 06E

KELLEHER, WILLIAM J.
ENVIRONMENTAL SURVEILLANCE AROUND A NUCLEAR FUEL REPROCESSING INSTALLATION, 1965-1967,
W70-00677 05C

KELLEY, JAMES C.
QUANTITATIVE STATISTICAL ANALYSES OF COLUMBIA RIVER SEDIMENT SAMPLES,
W70-00438 02J

CHARACTERISTICS OF COLUMBIA RIVER SEDIMENT AND SEDIMENT TRANSPORT,
W70-00446 02J

KELNHOFER, GUY
THE ILLINOIS STATE PLANNING PROGRAM,
W70-00753 06B

KELSO, M. M.
THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
W70-00693 06B

KENYON, NEIL H.
DIRECT ILLUSTRATION OF ONE WAY SAND TRANSPORT BY TIDAL CURRENTS,
W70-00436 02J

KESSLER, T.
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

KIMBALL, J. F., JR.
THE UPTAKE, ACCUMULATION AND EXCHANGE OF STRONTIUM-90 BY OPEN SEA PHYTOPLANKTON,
W70-00707 05C

KIRK, R. M.
RELATIONSHIPS BETWEEN GRAIN SIZE, SIZE-SORTING, AND FORESHORE SLOPE ON MIXED SAND-SHINGLE BEACHES,
W70-00651 02L

KIRVEN, M. M.
POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
W70-00709 05C

KNEESE, ALLEN V.
RESEARCH GOALS AND PROGRESS TOWARD THEM,
W70-00619 05G

KNETSCH, JACK L.
FEDERAL NATURAL RESOURCES DEVELOPMENT BASIC ISSUES IN BENEFIT AND COST MEASUREMENT,
W70-00494 06B

KNIPE, O. D.
ESTABLISHMENT AND SURVIVAL OF SEVERAL GRASSES IN THE SAGEBRUSH TYPE, WEST-CENTRAL NEW MEXICO,
W70-00762 04D

KNOPP, H.
EFFECTS OF INTRODUCTION OF HEATED WATER ON STREAMS (IN GERMAN),
W70-00748 05C

KOOPMANS, TJALLING C.
THREE ESSAYS ON THE STATE OF ECONOMIC SCIENCE,
W70-00630 06B

ALLOCATION OF RESOURCES AND THE PRICE SYSTEM,
W70-00631 06B

THE INTERACTION OF TOOLS AND PROBLEMS IN ECONOMICS,
W70-00632 06B

KOPADZE, T. V.
GLACIATION OF THE RIVER BASINS OF THE LEFT TRIBUTARIES OF THE ALAZANI AND THE PIRIKITA ALAZANI (IN GEORGIAN),
W70-00669 02C

KORMONDY, EDWARD J.
COMPARATIVE ECOLOGY OF SANDSPIT PONDS,
W70-00671 02L

KRAMER, WILLIAM
WATER AND WATERCOURSES--RIPARIAN RIGHTS AS APPLIED TO ARTIFICIAL WATERCOURSES,
W70-00523 06E

KRAUSE, KEITH S.
WATER QUALITY OBJECTIVES,
W70-00506 06B

KRONENBERG, GEORGE A.
REAL PROPERTY--EASEMENTS--CONSTRUCTION OF INSTRUMENT GRANTING RIGHT OF FLOWAGE,
W70-00548 04A

KRUTILLA, JOHN V.
FEDERAL NATURAL RESOURCES DEVELOPMENT BASIC ISSUES IN BENEFIT AND COST MEASUREMENT,
W70-00494 06B

KUENTZEL, L. E.
BACTERIA, CARBON DIOXIDE, AND ALGAL BLOOMS,
W70-00664 05C

KUENZLER, HOWARD W.
AN EXPERIMENTAL IN SITU DENSITOMETER,
W70-00462 07B

LA SALA, A. M., JR.
A RECONNAISSANCE OF STREAM SEDIMENT IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00466 02J

LAIRD, L. B.
PANEL DISCUSSION ON WATER QUALITY,
W70-00505 06B

LAMAR, WILLIAM L.
DETERMINATION OF PHENOXY ACID HERBICIDES IN WATER BY ELECTRON-CAPTURE AND MICROCOULOMETRIC GAS CHROMATOGRAPHY,
W70-00473 05A

LAMONDS, A. G.
WATER RESOURCES OF RANDOLPH AND LAWRENCE COUNTIES, ARKANSAS,
W70-00420 02E

LANE, DONEL J.
OREGON STATE INTEREST AND VIEWPOINT IN RIVER BASIN PLANNING IN THE WILLAMETTE COMPREHENSIVE STUDY,
W70-00509 06E

LANE, THOMAS H.
EFFECTS OF TOXICANTS ON COMMUNITY METABOLISM IN POOLS,
W70-00710 05C

LASALA, A. M., JR.
GROUNDWATER RESOURCES OF THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00687 02F

CHEMICAL QUALITY OF STREAMS IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00688 02K

LEGRAND, H. E.
HYDROLOGY OF CARBONATE ROCK TERRANES, A REVIEW-WITH SPECIAL REFERENCE TO THE UNITED STATES (PART 1),
W70-00454 02F

LENTNEK, B.
SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

LEPAWSKY, ALBERT
THE QUEST FOR QUALITY IN THE ADMINISTRATION OF RESOURCES,
W70-00610 06G

LETTAU, H.
EVAPOTRANSPIRATION CLIMATONOMY 1. A NEW APPROACH TO NUMERICAL PREDICTION OF MONTHLY EVAPOTRANSPIRATION, RUNOFF, AND SOIL MOISTURE STORAGE,
W70-00654 02D

LIEBSCHER, H. J.
EFFECTS OF INTRODUCTION OF HEATED WATER ON STREAMS (IN GERMAN),
W70-00748 05C

LINSLEY, RAY K.
WATER-RESOURCES ENGINEERING,
W70-00634 06D

LITVIN, L. F.
AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN LANDSCAPE-GEOMORPHOLOGICAL FACTORS AND SEDIMENT RUNOFF OF THE RIVERS OF THE WESTERN TRANSCAUCASUS (IN RUSSIAN),
W70-00656 02J

LIVINGSTONE, D. A.
VERTICAL DISTRIBUTION OF PHOSPHORUS IN LINSLEY POND MUD,
W70-00712 02H

LLOYD, R. MICHAEL
ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
W70-00445 02J

LOGAN, W. TURNER
TIDELANDS IN SOUTH CAROLINA A STUDY IN THE LAW OF REAL PROPERTY,
W70-00782 06E

LOTT, PETER F.
RADIOMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF SELENIUM USING 3, 3' -DIAMINOBENZIDINE AS THE INITIAL REAGENT,
W70-00460 05A

LOVELL, C. W., JR.
ERODIBILITY OF SAND-CLAY MIXTURES AS EVALUATED BY A WATER JET,
W70-00724 02J

LOVE, CLAUDE L.
NORTH CAROLINA AND OTHER ATLANTIC STATES,
W70-00770 06E

LUTEN, D. B.
RESOURCE QUALITY AND VALUE OF THE LANDSCAPE,
W70-00607 06G

LYMAN, SILAS ROBERT
THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
W70-00766 05G

LYSJI, I.
MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,

W70-00682 05B

MACAULAY, HUGH H.
THE USE OF SUBSIDIES FOR WASTE ABATEMENT,
W70-00488 05G

MACDONALD, JOHN A.
AN ORIENTATION STUDY OF THE URANIUM DISTRIBUTION IN LAKE WATERS, BEAVERLODGE DISTRICT, SASKATCHEWAN,
W70-00423 02H

MACEK, KENNETH J.
GROWTH AND RESISTANCE TO STRESS IN BROOK TROUT FED SUBLETHAL LEVELS OF DDT,
W70-00684 05C

MACK, RUTH P.
OUTDOOR RECREATION,
W70-00623 06B

MALEVSKIY-MALEVICH, S. P.
PATTERNS OF THE THERMAL REGIME OF THE SURFACE LAYER OF WATER,
W70-00741 02D

MALONEY, FRANK E.
LAWS OF FLORIDA GOVERNING WATER USE,
W70-00769 06D

MALONEY, F.
WATER LAW AND ADMINISTRATION - THE FLORIDA EXPERIENCE,
W70-00527 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 1 INTRODUCTION,
W70-00528 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 2 RIGHTS IN DEFINED WATERBODIES BASIC CONSIDERATIONS,
W70-00529 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 3 OWNERSHIP OF UPLAND AS THE SOURCE OF RIPARIAN RIGHTS,
W70-00530 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 4 NONCONSUMPTIVE USES OF NATURAL NAVIGABLE WATERBODIES,
W70-00531 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 5 CONSUMPTIVE USE OF WATER COMMON LAW RULES,
W70-00532 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 6 STATUTORY MODIFICATIONS OF EASTERN CONSUMPTIVE USE DOCTRINES,
W70-00533 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 7 RIGHTS IN DISPOSAL OF DIFFUSED SURFACE WATER,
W70-00534 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 8 FEDERAL AUTHORITY AND ACTIVITY AFFECTING FLORIDA'S WATER RESOURCES,
W70-00535 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 9 STATE ADMINISTRATION OF WATER RESOURCES IN FLORIDA,
W70-00536 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 10 SINGLE PURPOSE AND MULTIPURPOSE WATER MANAGEMENT DISTRICTS,
W70-00537 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 11 THE LAW AND ADMINISTRATION OF POLLUTION CONTROL IN FLORIDA,
W70-00538 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 12 TITLE TO BEDS UNDER NAVIGABLE WATERS,
W70-00539 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 13 A LOOK TO THE FUTURE,
W70-00540 04A

MARQUIS, R. H.
THE MOVEMENT FOR NEW WATER RIGHTS LAWS IN THE TENNESSEE VALLEY STATES,
W70-00577 06E

MARTINELLI, M., JR.
MEASURING ANGLES WITH A CARPENTER'S FOLDING RULER,
W70-00760 07B

MARTIN, WILLIAM E.
STRUCTURE OF THE ARIZONA ECONOMY OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
W70-00697 06B

MCKEAN, ROLAND N.
COST-BENEFIT ANALYSIS SELECTED ISSUES,
W70-00487 05G

MCLEAN, R. F.
RELATIONSHIPS BETWEEN GRAIN SIZE, SIZE-SORTING, AND FORESHORE SLOPE ON MIXED SAND-SHINGLE BEACHES,
W70-00651 02L

MCMASTER, WILLIAM M.
HYDROLOGIC DATA FOR THE OAK RIDGE AREA, TENNESSEE,
W70-00476 02E

MEUNARGIYA, S. V.
DETERMINATION OF DEPENDENCE BETWEEN FILTRATION CHARACTERISTICS OF DRAINAGE CANALS (IN RUSSIAN),
W70-00663 04A

MEYER, W. T.
URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
W70-00424 02H

MONNIK, M. J.
PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
W70-00726 03A

MOORE, A. M.
CORRELATION AND ANALYSIS OF WATER-TEMPERATURE DATA FOR OREGON STREAMS,
W70-00470 02E

MOORE, GEOFFREY H.
ANTICIPATING THE NATIONS NEED FOR ECONOMIC KNOWLEDGE,
W70-00620 6B

MOORE, G. K.
LIMESTONE HYDROLOGY IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
W70-00451 02F

MOORE, JAMES S., JR.
WATERS AND WATERCOURSES - EASEMENTS - IMPLIED DEDICATION OF FLOWAGE EASEMENT APPURTENANT TO A DAM,
W70-00802 04A

MOORE, WILLARD S.
OCEANIC CONCENTRATIONS OF RADIUM-228,
W70-00435 02K

MUMFORD, LEWIS
QUALITY IN THE CONTROL OF QUANTITY,
W70-00606 06G

MURRAY, R. C.
HYDROLOGY OF SOUTH BONAIRE, N. A. - A ROCK SELECTIVE DOLOMITIZATION MODEL,
W70-00441 02F

MYERS, SUMNER
OUTDOOR RECREATION,
W70-00623 06B

NAUJOKS, HERBERT H.
THE CHICAGO WATER DIVERSION CONTROVERSY,
W70-00554 04D

NEAL, V. T.
THERMAL STRATIFICATION IN THE ARCTIC OCEAN,
W70-00638 02C

NELSON, KURT H.
MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,
W70-00682 05B

NESHYBA, S.
THERMAL STRATIFICATION IN THE ARCTIC OCEAN,
W70-00638 02C

NESINA, L. V.
COMPUTATION OF THE COMPONENTS OF THE THERMAL BALANCE OF PLANNED RESERVOIRS,
W70-00744 02D

NEWCOME, ROY, JR.
GROUNDWATER RESOURCES OF THE PASCAGOULA RIVER BASIN, MISSISSIPPI AND ALABAMA,
W70-00477 02F

NEWTON, P. R.
MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,
W70-00682 05B

NICHOL, I.
INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
W70-00422 02J

NUNNELEE, L. J.
SELECTED WATER RESOURCES INDEX FOR WISCONSIN,
W70-00767 10

OLSSON, G. R.
PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
W70-00726 03A

ONG, H. LING
NATURAL ORGANIC ACIDS IN THE TRANSPORTATION, DEPOSITION, AND CONCENTRATION OF GOLD,
W70-00425 02K

OVERLY, FRED J.

CONSERVATION AND SOCIAL OBJECTIVES OF COMPREHENSIVE RIVER BASIN PLANNING,
W70-00503 06B

PAAL, L.
AN EXPERIMENTAL RESEARCH OF COEFFICIENT OF LONGITUDINAL DISPERSION FOR SMALL RIVERS (IN RUSSIAN),
W70-00743 05B

PANTIN, H. M.
THE APPEARANCE AND ORIGIN OF COLOURS IN MUDDY MARINE SEDIMENTS AROUND NEW ZEALAND,
W70-00661 02L

PASEKA, I. P.
OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
W70-00428 02K

PEAKALL, D. B.
POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
W70-00709 05C

PEARSON, JOHN E.
A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH VALIDITY TESTING OF A COMPARATIVE-PROJECTOR MODEL,
W70-00479 06A

PEREVEDENTSEV, YU. P.
DIFFERENTIAL EQUATION OF THE EVOLUTION OF DELUVIAL SLOPES (IN RUSSIAN),
W70-00648 02J

PESKIN, RICHARD L.
LAWS OF DISPERSION,
W70-00732 01A

PETERSON, HAROLD T., JR.
TRITIUM IN THE ENVIRONMENT FROM NUCLEAR POWERPLANTS,
W70-00716 05B

PETERSON, WILLIAM
ON SOME MEANINGS OF 'PLANNING',
W70-00611 06G

PIERCE, ROBERT L.
REDUCING LAND SUBSIDENCE IN THE WILMINGTON OIL FIELD BY THE USE OF SALINE WATERS,
W70-00447 05G

PILLSBURY, ARTHUR F.
SPRINKLER IRRIGATION,
W70-00695 03F

PLAGER, SHELDON J.
INTERFERENCE WITH THE PUBLIC RIGHT OF NAVIGATION AND THE RIPARIAN OWNER'S CLAIM OF PRIVILEGE,
W70-00546 06E

PLAGER, S.
WATER LAW AND ADMINISTRATION - THE FLORIDA EXPERIENCE,
W70-00527 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 1 INTRODUCTION,
W70-00528 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 2 RIGHTS IN DEFINED WATERBODIES BASIC CONSIDERATIONS,
W70-00529 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 3 OWNERSHIP OF UPLAND AS THE SOURCE OF RIPARIAN RIGHTS,
W70-00530 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 4 NONCONSUMPTIVE USES OF NATURAL NAVIGABLE WATERBODIES,
W70-00531 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 5 CONSUMPTIVE USE OF WATER COMMON LAW RULES,
W70-00532 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 6 STATUTORY MODIFICATIONS OF EASTERN CONSUMPTIVE USE DOCTRINES,
W70-00533 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 7 RIGHTS IN DISPOSAL OF DIFFUSED SURFACE WATER,
W70-00534 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 8 FEDERAL AUTHORITY AND ACTIVITY AFFECTING FLORIDA'S WATER RESOURCES,
W70-00535 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 9 STATE ADMINISTRATION OF WATER RESOURCES IN FLORIDA,
W70-00536 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 10 SINGLE PURPOSE AND MULTIPURPOSE WATER MANAGEMENT DISTRICTS,
W70-00537 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 11 THE LAW AND ADMINISTRATION OF POLLUTION CONTROL IN FLORIDA,
W70-00538 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 12 TITLE TO BEDS UNDER NAVIGABLE WATERS,
W70-00539 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 13 A LOOK TO THE FUTURE,
W70-00540 04A

PLEBUCH, RAYMOND O.
WATER RESOURCES OF RANDOLPH AND LAWRENCE COUNTIES, ARKANSAS,
W70-00420 02E

POWER, JOHN F.
LITTORAL RIGHTS ON THE GREAT LAKES,
W70-00574 06E

PRICE, DON
GROUNDWATER RECONNAISSANCE IN THE BURNT RIVER VALLEY AREA, OREGON,
W70-00468 02F

PROCACCIA, H.
APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
W70-00679 04A

PROKOPOVICH, NIKOLA P.
DEPOSITION OF CLASTIC SEDIMENTS BY CLAMS,
W70-00442 02J

PYLAT, P. M.
OXIDIZING-REDUCING CONDITIONS OF THE 'NAFTUSIA' MINERAL WATERS FORMATION (RUSSIAN),
W70-00428 02K

RAABE, E. W.
BIOCHEMICAL OXYGEN DEMAND AND DEGRADATION OF LIGNIN IN NATURAL WATERS,
W70-00681 05B

RAATS, PETRUS A. C.
FORCES ACTING UPON THE SOLID PHASE OF A POROUS MEDIUM,
W70-00459 02G

RACHFORD, THOMAS M.
ECONOMIC ANALYSIS OF ALTERNATIVE FLOOD CONTROL MEASURES BY DIGITAL COMPUTER,
W70-00617 06A

RASMUSSEN, LOWELL A.
THREE-DIMENSIONAL SURGES AND RECOVERIES IN A NUMERICAL GLACIER MODEL,
W70-00443 02C

READ, FRED K.
WATER BOUNDARIES,
W70-00570 04A

REICHE, P.
POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
W70-00709 05C

RENSHAW, EDWARD F.
THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

RHASIN, R. N.
ERODIBILITY OF SAND-CLAY MIXTURES AS EVALUATED BY A WATER JET,
W70-00724 02J

RICE, DAVID A.
ESTUARINE LAND OF NORTH CAROLINA LEGAL ASPECTS OF OWNERSHIP, USE, AND CONTROL,
W70-00565 06E

RICE, T. R.
THE ROLE OF PHYTOPLANKTON IN THE CYCLING OF RADIONUCLIDES IN THE MARINE ENVIRONMENT,
W70-00708 05C

RISEBROUGH, R. W.
POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
W70-00709 05C

RITTER, JOHN R.
OPTICAL METHOD FOR DETERMINING PARTICLE SIZES OF COARSE SEDIMENT,
W70-00655 02J

ROCKWELL, MATTHEW L.
PLANNING FOR WATER RESOURCE DEVELOPMENT THE FORMULATION OF A STRATEGY,
W70-00512 06B

ROHUSAAR, L.
AN EXPERIMENTAL RESEARCH OF COEFFICIENT OF LONGITUDINAL DISPERSION FOR SMALL RIVERS (IN RUSSIAN),
W70-00743 05B

ROSENBERG, NORMAN J.
AGRICULTURAL METEOROLOGY IN ISRAEL,
W70-00691 03F

ROSENBERG, N. J.
RESEARCH IN EVAPOTRANSPIRATION,

W70-00450 02D

ADVECTIVE CONTRIBUTION OF ENERGY UTILIZED IN EVAPOTRANSPIRATION BY ALFALFA IN THE EAST CENTRAL GREAT PLAINS (U.S.A.),
W70-00690 02D

ROSENCRANTZ, DONALD M.
A DIVERSIFIED PROGRAM FOR THE STUDY OF SHALLOW WATER SEARCHING AND MAPPING TECHNIQUES,
W70-00461 07B

ROSSI, ROBERT R.
PUBLIC RIGHT AND THE RULE OF NO COMPENSATION,
W70-00785 04A

ROSS, MARTIN
RADAR-COMPUTED RAINFALL COMPARED WITH OBSERVATIONS FROM A DENSE NETWORK OF RAIN GAUGES,
W70-00483 07A

RUNNELLS, DONALD D.
DIAGENESIS, CHEMICAL SEDIMENTS, AND THE MIXING OF NATURAL WATERS,
W70-00674 02K

RUSSEL, CLIFFORD S.
EFFLUENT CHARGES,
W70-00489 05G

RUTTAN, V. W.
REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

RYMASZEWSKA, MARIA
A NOTE ON THE DEPENDENCE BETWEEN THE CONCENTRATION OF CHLORIDE IONS AND THE RADIOACTIVITY OF EMANATION DISSOLVED IN MINERAL WATERS (IN POLISH),
W70-00668 05A

SAFRONOV, A. F.
ON THE GEOCHEMISTRY OF UPPER PALEOZOIC AND LOWER MESOZOIC SEDIMENTS OF THE NORTHERN PART OF THE CISVERKHOYANSK TROUGH (RUSSIAN),
W70-00429 02K

SAF'YANOV, G. A.
CALCULATION OF SEDIMENT BALANCE OF THE LITTORAL ZONE (IN RUSSIAN),
W70-00649 02L

SALEEM, MOHAMMAD
AN INEXPENSIVE METHOD FOR DETERMINING THE DIRECTION OF NATURAL FLOW OF GROUNDWATER,
W70-00635 02F

SANDIN, D. E.
RESEARCH IN EVAPOTRANSPIRATION,
W70-00450 02D

SCHAEFER, MILNER B.
PROBLEMS OF QUALITY AND QUANTITY IN THE MANAGEMENT OF THE LIVING RESOURCES OF THE SEA,
W70-00608 06G

SCHERER, FREDERICK M.
GOVERNMENT RESEARCH AND DEVELOPMENT PROGRAMS,
W70-00621 06B

SCHMIDT, R. A., JR.
MEASURING ANGLES WITH A CARPENTER'S FOLDING RULER,
W70-00760 07B

SCHROEDER, JOHANNES H.
EXPERIMENTAL DISSOLUTION OF CALCIUM, MAGNESIUM, AND STRONTIUM FROM RECENT BIOGENIC CARBONATES A MODEL OF DIAGENESIS,
W70-00444 02K

SCHULTZ, ARNOLD M.
THE ECOSYSTEM AS A CONCEPTUAL TOOL IN THE MANAGEMENT OF NATURAL RESOURCES,
W70-00600 06G

SCOTT, C. H.
STAGE-DISCHARGE CHARACTERISTICS OF A WEIR IN A SAND-CHANNEL STREAM,
W70-00418 02E

SEABLOOM, ROBERT W.
BACTERIOLOGICAL EFFECT OF SMALL BOAT WASTES ON SMALL HARBORS,
W70-00722 05C

SEARS, JAMES D.
POTENTIAL SOCIOLOGICAL RESEARCH IN WATER RESOURCES DEVELOPMENT,
W70-00757 06B

SENDLEIN, LYLE V. A.
GEOLOGY OF THE REGOLITH AQUIFERS OF THE NISHNABOTNA BASIN,
W70-00458 02F

SEVON, W. D.
STRATIGRAPHY AND SEDIMENTOLOGY OF THE TERTIARY ROCKS OF THE MANDAMUS-DOVE RIVER AREA, NORTH CANTERBURY, NEW ZEALAND,
W70-00644 02J

SHANNON, L. V.
THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
W70-00434 02K

SHARKEY, A. G., JR.
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

SHARP, ROBERT E.
LIABILITY OF LANDOWNERS FOR POLLUTION OF PERCOLATING WATERS,
W70-00521 05G

SHEAFFER, JOHN R.
THE INTERACTION OF URBAN REDEVELOPMENT AND FLOOD PLAIN MANAGEMENT IN WATERLOO, IOWA,
W70-00752 06B

SHEEHY, ANN
IRRIGATION IN THE AMU-DAR'YA BASIN PROGRESS REPORT,
W70-00705 03F

SHERWOOD, W. CULLEN
PORE STUDIES OF HIGHLY INDURATED APPALACHIAN ROCKS,
W70-00659 02F

SHINN, EUGENE A.
ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
W70-00445 02J

SHULTZ, J. L.
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

SIEBURTH, JOHN MCN
SEASONAL SELECTION OF ESTUARINE BACTERIA BY WATER TEMPERATURE,
W70-00713 05C

SKOOG, FOLKE
THE ISOLATION, PURIFICATION, AND NUTRIENT SOLUTION REQUIREMENTS OF BLUE-GREEN ALGAE,
W70-00719 05C

SLAUGHTER, HERBERT J.
CURRENT LEGISLATION,
W70-00776 06E

SMITH, ALVIN L., JR.
A CLIMATOLOGICAL BIBLIOGRAPHY OF THE SOUTH ATLANTIC OCEAN AREA, INCLUDING CERTAIN COASTAL COUNTRIES,
W70-00481 10

SMITH, A. Y.
THE USE OF RADON-222 IN SURFACE WATERS IN GEOCHEMICAL PROSPECTING FOR URANIUM,
W70-00421 02J

SMITH, J. DUNCAN
GEOMORPHOLOGY OF A SAND RIDGE,
W70-00453 02J

SMITH, KEITH V.
COST OF CAPITAL TO THE SMALL FIRM,
W70-00616 06C

SMITH, LINCOLN
THE GREAT POND ORDINANCE--COLLECTIVISM IN NORTHERN NEW ENGLAND,
W70-00522 06E

SMITH, MARION W.
NAVIGABLE WATERS--RIGHT OF RIPARIAN OWNER TO ARTIFICIAL ACCRETION,
W70-00798 04A

SNELLINGS, D. D., JR.
A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
W70-00678 05G

SNYDER, WILLIAM M.
COMPUTER-ORIENTED METHOD OF OPTIMIZING HYDROLOGIC MODEL PARAMETERS,
W70-00642 06A

SOO, S. L.
FLUID DYNAMICS OF MULTIPHASE SYSTEMS,
W70-00469 02F

SOREN, JULIAN
RESULTS OF SUBSURFACE EXPLORATION IN THE MID-ISLAND AREA OF WESTERN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
W70-00455 02F

SPANGLER, MILLER B.
THE ROLE OF MARINE SCIENCES IN THE MULTIPLE USES OF THE COASTAL ZONE OF LAKE ERIE AND LAKE SUPERIOR,
W70-00457 02L

SPENCER, THOMAS C.
THE RIGHT OF ACCESS TO NAVIGABLE WATERS--COMPENSABILITY UNDER EMINENT DOMAIN,
W70-00567 04A

STEPHENSON, DAVID
OPTIMUM ALLOCATION OF WATER RESOURCES BY MATHEMATICAL PROGRAMMING,
W70-00641 06A

STERN, DANIEL H.
A LIMNOLOGICAL STUDY OF A TENNESSEE COLD SPRINGBROOK,
W70-00672 02I

STERN, MICHELE S.
A LIMNOLOGICAL STUDY OF A TENNESSEE COLD SPRINGBROOK,
W70-00672 02I

STEVENSON, ALBERT H.
WATER FOR PEOPLE,
W70-00756 06B

STEWART, HENRY
AREAS OF DEFICIENCY AND RESEARCH NEEDS IN WATER RESOURCE PLANNING,
W70-00501 06B

STEWART, ROBERT S.
COMMON LAW RIGHTS TO SURFACE WATERS,
W70-00799 04A

STOLTE, WILLIAM J.
PHYSICAL INFLUENCES ON FLOW SERIAL CORRELATION,
W70-00723 02E

STONE, OLIVER L.
UNITED STATES LEGISLATION RELATING TO THE CONTINENTAL SHELF,
W70-00773 06E

STRINGFIELD, V. T.
HYDROLOGY OF CARBONATE ROCK TERRANES, A REVIEW-WITH SPECIAL REFERENCE TO THE UNITED STATES (PART 1),
W70-00454 02F

SUMMERHAYES, C. P.
RECENT SEDIMENTATION AROUND NORTHERNMOST NEW ZEALAND,
W70-00645 02J

SVARLIEN, OSCAR
THE TERRITORIAL SEA A QUEST FOR UNIFORMITY,
W70-00519 06E

SWANSON, VERNON E.
NATURAL ORGANIC ACIDS IN THE TRANSPORTATION, DEPOSITION, AND CONCENTRATION OF GOLD,
W70-00425 02K

SWECKER, MILTON N.
ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
W70-00419 02L

TATTERSALL, JAMES N.
FORECASTING REGIONAL ECONOMIC GROWTH SOME PROBLEMS AND PITFALLS,
W70-00498 06B

TCHOBANOGLOUS, GEORGE
CHEMICAL PROCESSING OF WASTEWATER FOR NUTRIENT REMOVAL,
W70-00680 05D

TECLAFF, LUDWIK A.
UNITED STATES RIVER TREATIES,
W70-00518 06E

TERRY, JACK C.
EQUAL FOOTING AND THE MARGINAL SEA,
W70-00804 04A

THOMAS, D. M.
GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
W70-00440 02E

THOMAS, H. E.
SURFACE WATER AND RELATED CLIMATE FEATURES OF THE SAHIL SUSAH AREA, TUNISIA,
W70-00471 02E

THUY, NGUYEN NGOC
APPLICATION OF THE SPECTRAL ANALYSIS METHOD TO THE PRE-ESTIMATION OF TIDES (IN RUSSIAN),
W70-00643 02L

TIJORIWALA, ANILKUMAR G.
STRUCTURE OF THE ARIZONA ECONOMY OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
W70-00697 06B

TILLER, R. A.
THE EFFECT OF TEMPERATURE ON THE ACUTE TOXICITY OF PHENOL TO RAINBOW TROUT IN HARD WATER,
W70-00746 05C

TIMOFEYEV, M. P.
PATTERNS OF THE THERMAL REGIME OF THE SURFACE LAYER OF WATER,
W70-00741 02D

TOEBES, G. H.
ERODIBILITY OF SAND-CLAY MIXTURES AS EVALUATED BY A WATER JET,
W70-00724 02J

STATISTICAL ANALYSIS OF MEANDERING RIVER GEOMETRY,
W70-00725 02E

TOLLEY, G. S.
OPERATIONAL PROCEDURES FOR EVALUATING FLOOD PROTECTION BENEFITS,
W70-00625 06F

OPTIMAL WATER ALLOCATION THE NORTH PLATTE RIVER,
W70-00629 06D

TRAIL, J. R.
SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

TROCK, WARREN L.
INSTITUTIONAL FACTORS AND THE TEXAS WATER PLAN,
W70-00492 06B

TROFIMOV, A. M.
DIFFERENTIAL EQUATION OF THE EVOLUTION OF DELUVIAL SLOPES (IN RUSSIAN),
W70-00648 02J

TUFFEY, THOMAS J.
CONTRIBUTION OF PHOTOSYNTHETIC REAERATION TO TOTAL REAERATION OF THE PASSAIC RIVER,
W70-00731 05B

ULLMAN, EDWARD L.
A MEASURE OF WATER RECREATION BENEFITS THE MERAMEC BASIN EXAMPLE,
W70-00507 06B

UNDERHILL, ROBERT M.
DETERMINATION OF RIGHTS TO REAL PROPERTY ALONG THE MISSOURI RIVER IN CONNECTION WITH RIVER STABILIZATION,
W70-00572 04A

UPOROVA, L. P.
THE USE OF EXPONENTIAL FUNCTIONS WHEN CONSTRUCTING THE LAWS OF THE DISTRIBUTION OF GEOGRAPHICAL AND HYDROMETEOROLOGICAL PARAMETERS (IN RUSSIAN),
W70-00657 02A

UTTER, L. C.
SELECTED WATER RESOURCES INDEX FOR WISCONSIN,
W70-00767 10

UTTORMARK, P. D.
SELECTED WATER RESOURCES INDEX FOR WISCONSIN,
W70-00767 10

VAN DER LINDEN, WILLIAM J. M.
OFF-SHORE SEDIMENTS, NORTH-WEST NELSON, SOUTH ISLAND, NEW ZEALAND,
W70-00660 02L

VAN DER LINGEN, G. J.
ENVIRONMENTALLY SIGNIFICANT SEDIMENTOLOGIC CHARACTERISTICS OF BEACH SANDS,
W70-00650 02L

VAN DOREN, C. S.
SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

VAN ZYL, F. D. WALLACE
WATER RESOURCES PLANNING IN AUSTRALIA,
W70-00704 06B

VELNER, H.
AN EXPERIMENTAL RESEARCH OF COEFFICIENT OF LONGITUDINAL DISPERSION FOR SMALL RIVERS (IN RUSSIAN),
W70-00743 05B

VISHER, GLENN S.
GRAIN SIZE DISTRIBUTIONS AND DEPOSITIONAL PROCESSES,
W70-00639 02J

VITT, LAWRENCE D.
PLANT SIZING FOR A SEASONAL PRODUCT DEMAND USING A LINEAR PROGRAMMING MODEL,
W70-00604 06A

VORHIS, ROBERT C.
HYDROLOGIC EFFECTS OF THE EARTHQUAKE OF MARCH 27, 1964, OUTSIDE ALASKA,
W70-00467 02E

WAELTI, JOHN J.
UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA,
W70-00430 05G

WANG, S. J.
HYDROLOGY OF FROZEN GROUND FLOODS,
W70-00721 02C

WARINNER, J. E.
THE EFFECTS OF THERMAL EFFLUENTS ON MARINE ORGANISMS,
W70-00747 05C

WARNICK, CALVIN C.
SOCIAL PROBLEMS NEEDING SOLUTIONS, STATE AGENCIES,
W70-00758 06B

WEAVER, CHARLES L.
TRITIUM IN THE ENVIRONMENT FROM NUCLEAR POWERPLANTS,
W70-00716 05B

WEBBER, L. R.
NITROGEN CONTAMINATION OF GROUNDWATER BY BARNYARD LEACHATES,
W70-00665 05B

WEBB, J. S.
INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
W70-00422 02J

WHETTEN, JOHN T.
QUANTITATIVE STATISTICAL ANALYSES OF COLUMBIA RIVER SEDIMENT

SAMPLES,
W70-00438 02J

CHARACTERISTICS OF COLUMBIA RIVER SEDIMENT AND SEDIMENT TRANSPORT,
W70-00446 02J

WHIPPLE, WILLIAM, JR.
FLOOD CONTROL POLICY AND FLOOD MANAGEMENT,
W70-00728 06F

OPTIMUM INESTMENT IN STRUCTURAL FLOOD CONTROL,
W70-00729 06B

ECONOMIC CONSIDERATIONS RELATIVE TO WATER QUALITY,
W70-00730 05G

ANNUAL REPORT FISCAL YEAR 1968-69,
W70-00733 09D

WHITE, THOMAS E.
TRACTIONABILITY STUDY FOR THE LAOTIAN PANHANDLE,
W70-00484 02G

WHITWORTH, WALTER R.
EFFECTS OF TOXICANTS ON COMMUNITY METABOLISM IN POOLS,
W70-00710 05C

WIERSMA, JAMES H.
RADIOMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF SELENIUM USING 3, 3' -DIAMINOBENZIDINE AS THE INITIAL REAGENT,
W70-00460 05A

WIGLEY, T. L.
WATER BUDGET STUDIES IN KARST AQUIFERS,
W70-00676 02F

WILLIAMS, RUTH
TIDELANDS IN SOUTH CAROLINA A STUDY IN THE LAW OF REAL PROPERTY,
W70-00782 06E

WILSON, E. F.
A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
W70-00678 05G

WILSON, JAMES T.
WATER-RELATED RESEARCH FOR THE GREAT LAKES REGION,
W70-00433 02H

WITTMUSS, HOWARD D.
ENGINEERING PHASES OF LAND TREATMENT RELATED TO INCREASING WATER-USE EFFICIENCY AND STORAGE EFFICIENCY RAINFALL,
W70-00448 04A

WOLFE, RICHARD P.
THE APPROPRIATION OF PROPERTY FOR LEVEES A LOUISIANA STUDY IN TAKING WITHOUT JUST COMPENSATION,
W70-00562 04A

W70-00563 04A

W70-00564 04A

WOLLMAN, NATHANIEL
THE WATER RESOURCES OF CHILE AN ECONOMIC METHOD FOR ANALYZING A KEY RESOURCE IN A NATION'S DEVELOPMENT,
W70-00699 06B

WOLMAN, ABEL
A FRESH APPROACH TO WATER LAW,
W70-00768 06B

WOODYER, K. D.
RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
W70-00698 02E

WULFF, H. E.
THE QANATS OF IRAN,
W70-00692 04B

WU, I-PAI
HYDROGRAPH STUDY AND PEAK DISCHARGE DETERMINATION OF HAWAIIAN SMALL WATERSHEDS ISLAND OF OAHU,
W70-00449 02A

YOUNG, P. JONATHAN
THE USE OF INVERTEBRATES IN A WATER QUALITY INVESTIGATION A BIOLOGICAL STUDY OF THE MIAMI RIVER, OHIO,
W70-00475 05C

ZEIDLER, FRANK P.
DEVELOPING POSITIVE PUBLIC ATTITUDES FOR WATER RESOURCE DEVELOPMENT,
W70-00514 06B

ORGANIZATIONAL INDEX

ADELAIDE UNIV. (AUSTRALIA). FACULTY OF ARCHITECTURE AND TOWN PLANNING.
WATER RESOURCES PLANNING IN AUSTRALIA,
W70-00704 06B

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. HYDROGRAPH LAB.
SOME METEOROLOGICAL REQUIREMENTS IN WATERSHED ENGINEERING RESEARCH,
W70-00474 07A

AGRICULTURAL RESEARCH SERVICE, MADISON, WIS.
FORCES ACTING UPON THE SOLID PHASE OF A POROUS MEDIUM,
W70-00459 02G

AKADEMIYA NAUK AZERBAIDZHANSKOI SSR, BAKU. INSTITUT GEOLOGII.
SOME CHARACTERISTICS OF THE WATERS OF GEORGIAN MUD VOLCANOES (IN RUSSIAN),
W70-00670 02K

AKADEMIYA NAUK GRUZINSKOI SSR, TIFLIS.
DETERMINATION OF DEPENDENCE BETWEEN FILTRATION CHARACTERISTICS OF DRAINAGE CANALS (IN RUSSIAN),
W70-00663 04A

AKADEMIYA NAUK SSSR. INSTITUT GEOLOGII.
ON THE GEOCHEMISTRY OF UPPER PALEOZOIC AND LOWER MESOZOIC SEDIMENTS OF THE NORTHERN PART OF THE CISVERKHOYANSK TROUGH (RUSSIAN),
W70-00429 02K

AMAX EXPLORATION, INC., VANCOUVER (BRITISH COLUMBIA) AND IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND). DEPT. OF GEOLOGY.
INFLUENCE OF VARIATIONS IN SECONDARY ENVIRONMENT ON THE METAL CONTENT OF DRAINAGE SEDIMENTS,
W70-00422 02J

ARIZONA STATE UNIV., TEMPE. DEPT. OF ZOOLOGY.
PESTICIDES AND FISHES--A REVIEW OF SELECTED LITERATURE,
W70-00718 05C

ARIZONA UNIV., TUCSON. DEPT. OF AGRICULTURAL ECONOMICS.
THE CONDITIONS FOR ECONOMIC GROWTH OF THE ARID LANDS,
W70-00693 06B

STRUCTURE OF THE ARIZONA ECONOMY OUTPUT INTERRELATIONSHIPS AND THEIR EFFECTS ON WATER AND LABOR REQUIREMENTS. PART I. THE INPUT-OUTPUT MODEL AND ITS INTERPRETATION,
W70-00697 06B

ARIZONA UNIV., TUCSON. ENVIRONMENTAL RESEARCH LAB.
POWER, WATER AND FOOD FOR DESERT COASTS AN INTEGRATED SYSTEM FOR PROVIDING THEM,
W70-00694 03A

ARKANSAS STATE DEPT. OF HEALTH, LITTLE ROCK. DIV. OF RADIOLOGICAL HEALTH.
A 5-YEAR SUMMARY OF THE REGULATORY CONTROL OF RADIOACTIVE MATERIAL IN ARKANSAS,
W70-00678 05G

AUCKLAND UNIV. (NEW ZEALAND). DEPT. OF GEOLOGY.
SEDIMENTARY FEATURES AND PENECONTEMPORANEOUS SLUMPING IN THE WAITEMATA GROUP, WHANGAPARAOA PENINSUAL, NORTH AUCKLAND, NEW ZEALAND,
W70-00653 02J

AUSTRALIAN NATIONAL UNIV., CANBERRA. DEPT. OF GEOLOGY.
SEDIMENTOLOGY OF THE WAITEMATA GROUP IN THE STANLEY POINT-DEVONPORT AREA, AUCKLAND, NEW ZEALAND,
W70-00652 02J

BATTELLE-NORTHWEST, RICHLAND, WASH. PACIFIC NORTHWEST LAB.
CHEMICAL INTERACTIONS OF WASTEWATER IN A SOIL ENVIRONMENT,
W70-00658 05D

BOOZ-ALLEN APPLIED RESEARCH, INC., BETHESDA, MD.
PARAMETRIC ECONOMIC AND ENGINEERING EVALUATION STUDY FOR WATER DESALINATION,
W70-00726 03A

BRITISH ELECTRICITY AUTHORITY. RESEARCH DEPT.
PERFORMANCE OF NATURAL-DRAUGHT WATER COOLING TOWERS,
W70-00745 05D

BRITISH NEWFOUNDLAND EXPLORATION LTD.
URANIUM IN LAKE WATER FROM THE KAIPOKOK REGION, LABRADOR,
W70-00424 02H

BUNDESANSTALT FUER GEWASSERKUNDE, COBLENZ (WEST GERMANY).
EFFECTS OF INTRODUCTION OF HEATED WATER ON STREAMS (IN GERMAN),
W70-00748 05C

BUREAU OF COMMERCIAL FISHERIES, BEAUFORT, N.C.
THE ROLE OF PHYTOPLANKTON IN THE CYCLING OF RADIONUCLIDES IN THE MARINE ENVIRONMENT,
W70-00708 05C

BUREAU OF MINES, PITTSBURGH, PA. PITTSBURGH MINING RESEARCH CENTER.
DETERMINING ORGANIC CONTAMINANTS IN AIR AND WATER,
W70-00427 05A

BUREAU OF OUTDOOR RECREATION, WASHINGTON, D.C.
CONSERVATION AND SOCIAL OBJECTIVES OF COMPREHENSIVE RIVER BASIN PLANNING,
W70-00503 06B

BUREAU OF RADIOLOGICAL HEALTH, ROCKVILLE, MD.
TRITIUM IN THE ENVIRONMENT FROM NUCLEAR POWERPLANTS,
W70-00716 05B

BUREAU OF RECLAMATION, SACRAMENTO, CALIF.
DEPOSITION OF CLASTIC SEDIMENTS BY CLAMS,
W70-00442 02J

BUREAU OF SPORT FISHERIES AND WILDLIFE, WARM SPRINGS, GA.
EFFECTS OF TOXICANTS ON COMMUNITY METABOLISM IN POOLS,
W70-00710 05C

CALIFORNIA UNIV., BERKELEY.
QUALITY IN THE CONTROL OF QUANTITY,
W70-00606 06G

RESOURCE QUALITY AND VALUE OF THE LANDSCAPE,
W70-00607 06G

THE ECOSYSTEM AS A CONCEPTUAL TOOL IN THE MANAGEMENT OF NATURAL RESOURCES,
W70-00609 06G

THE QUEST FOR QUALITY IN THE ADMINISTRATION OF RESOURCES,
W70-00610 06G

ON SOME MEANINGS OF 'PLANNING',
W70-00611 06G

RESOURCE QUALITY NEW DIMENSIONS AND PROBLEMS FOR PUBLIC POLICY,
W70-00612 06A

ASSET PRICES IN ECONOMIC ANALYSIS,
W70-00626 06C

COST ALLOCATION IN RELATION TO WESTERN WATER POLICIES,
W70-00633 06C

CALIFORNIA UNIV., BERKELEY. MARINE RESOURCES INST. CALIFORNIA UNIV., DAVIS. DEPT. OF ZOOLOGY CORNELL UNIV., ITHACA, N.Y. DIV. OF ECOLOGY AND SYSTEMATICS AND SAN DIEGO NATURAL HISTORY MUSEUM, CALIF.
POLYCHLORINATED BIPHENYLS IN THE GLOBAL ECOSYSTEM,
W70-00709 05C

CALIFORNIA UNIV., LOS ANGELES.
COST OF CAPITAL TO THE SMALL FIRM,
W70-00616 06C

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA.
PROBLEMS OF QUALITY AND QUANTITY IN THE MANAGEMENT OF THE LIVING RESOURCES OF THE SEA,
W70-00608 06G

CANTERBURY UNIV., CHRISTCHURCH (NEW ZEALAND). DEPT. OF GEOGRAPHY.
RELATIONSHIPS BETWEEN GRAIN SIZE, SIZE-SORTING, AND FORESHORE SLOPE ON MIXED SAND-SHINGLE BEACHES,
W70-00651 02L

CAPE TOWN UNIV. (SOUTH AFRICA). DEPT OF PHYSICS, AND DIVISION OF SEA FISHERIES, SEA POINT (SOUTH AFRICA).
THORIUM-228 IN MARINE PLANKTON AND SEA-WATER,
W70-00434 02K

CARNEGIE-MELLON UNIV., PITTSBURGH, PA. DEPT. OF ECONOMICS.
EXTERNALITIES AND THE QUALITY OF AIR AND WATER,
W70-00490 05G

CENTRAL CREIL EXPLOITATION SERVICE (FRANCE) AND DEPARTMENTS OF TESTS AND THERMAL STUDIES (FRANCE).
APPARATUS FOR TEMPERATURE MEASURING IN THE STUDIES OF DISCHARGES BY WATER PUMPS, USING THERMODYNAMICAL METHOD (IN FRENCH),
W70-00679 04A

CENTRAL MICHIGAN UNIV., MOUNT PLEASANT.
IRRIGATION WATER USE IN THE UTAH VALLEY, UTAH,
W70-00627 03F

CHICAGO UNIV., ILL.
THE RELATIONSHIP BETWEEN FLOOD LOSSES AND FLOOD-CONTROL BENEFITS,
W70-00628 06C

CHICAGO UNIV., ILL. DEPT. OF THE GEOPHYSICAL SCIENCES.
GEOMORPHOLOGY OF A SAND RIDGE,
W70-00453 02J

CLEMSON UNIV., S.C. DEPT. OF ECONOMICS.
THE USE OF SUBSIDIES FOR WASTE ABATEMENT,
W70-00488 05G

COLORADO SCHOOL OF MINES, GOLDEN AND GEOLOGICAL SURVEY, DENVER, COLO.
NATURAL ORGANIC ACIDS IN THE TRANSPORTATION, DEPOSITION, AND CONCENTRATION OF GOLD,
W70-00425 02K

COLORADO UNIV., BOULDER. DEPT. OF GEOLOGICAL SCIENCES.
DIAGENESIS, CHEMICAL SEDIMENTS, AND THE MIXING OF NATURAL WATERS,

W70-00674 02K

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF LAND RESEARCH AND REGIONAL SURVEY.
RECONNAISSANCE ESTIMATION OF STREAM DISCHARGE-FREQUENCY RELATIONSHIPS,
W70-00698 02E

COPENHAGEN UNIV. (DENMARK). INST. OF PHYSICAL OCEANOGRAPHY.
OPTICAL OCEANOGRAPHY,
W70-00464 07B

CORNELL UNIV., ITHACA, N.Y.
MAKING THE STATE AN EFFECTIVE PARTNER IN WATER DEVELOPMENT,
W70-00513 06B

COMMENT ON ECONOMY OF WATER QUALITY MANAGEMENT AND POLLUTION CONTROL,
W70-00613 05G

DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C. AND NORTH CAROLINA STATE UNIV., RALEIGH.
OPERATIONAL PROCEDURES FOR EVALUATING FLOOD PROTECTION BENEFITS,
W70-00625 06F

DEPARTMENT OF FISHERIES AND FORESTRY, SILLERY (QUEBEC).
TIDAL FLAT EROSION BY ICE AT LA POCATIERE, ST. LAWRENCE ESTUARY,
W70-00640 02L

DUKE UNIV., DURHAM N.C. DEPT. OF ZOOLOGY.
VERTICAL DISTRIBUTION OF PHOSPHORUS IN LINSLEY POND MUD,
W70-00712 02H

EDENS EQUIPMENT CO., CHICAGO, ILL.
MECHANICAL RETRIEVAL OF WASTE OILS AND SOLIDS FROM WATER,
W70-00685 05D

EG AND G, INC., LAS VEGAS, NEV.
WATER USE AND THERMAL POLLUTION,
W70-00742 05C

ELDORADO MINING AND REFINING LTD., MONTREAL (QUEBEC).
AN ORIENTATION STUDY OF THE URANIUM DISTRIBUTION IN LAKE WATERS, BEAVERLODGE DISTRICT, SASKATCHEWAN,
W70-00423 02H

ENVIRONMENTAL TECHNICAL APPLICATIONS CENTER (AIR FORCE) WASHINGTON, D.C.
A CLIMATOLOGICAL BIBLIOGRAPHY OF THE SOUTH ATLANTIC OCEAN AREA, INCLUDING CERTAIN COASTAL COUNTRIES,
W70-00481 10

ENVIRONMENTAL TECHNICAL APPLICATIONS CENTER (AIR FORCE), WASHINGTON, D.C.
AN ANNOTATED CLIMATOLOGICAL BIBLIOGRAPHY OF ROMANIA,
W70-00482 10

RADAR-COMPUTED RAINFALL COMPARED WITH OBSERVATIONS FROM A DENSE NETWORK OF RAIN GAUGES,
W70-00483 07A

TRACTIONABILITY STUDY FOR THE LAOTIAN PANHANDLE,
W70-00484 02G

EUGENE WATER AND ELECTRIC BOARD, OREG.
CREDIT AND COLLECTION POLICIES AT EUGENE, OREGON,
W70-00597 06C

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, ATHENS, GA. SOUTHEAST WATER LAB.
NEUTRALIZATION OF ACID MINE DRAINAGE,
W70-00662 05D

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, CINCINNATI, OHIO. DIV. OF TECHNICAL SERVICES.
BIOCHEMICAL OXYGEN DEMAND AND DEGRADATION OF LIGNIN IN NATURAL WATERS,
W70-00681 05B

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, DULUTH, MINN. NATIONAL WATER QUALITY LAB.
THE USE OF ARTIFICIAL SUBSTRATES IN POLLUTION SURVEYS,
W70-00666 05B

FLORIDA UNIV., GAINESVILLE, AND NORTHWESTERN UNIV., EVANSTON, ILL.
PRODUCTION COST FACTOR IN RATE-MAKING,
W70-00602 06C

FLORIDA UNIV., GAINESVILLE. WATER RESOURCES RESEARCH CENTER.
WATER LAW AND ADMINISTRATION - THE FLORIDA EXPERIENCE,
W70-00527 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 1 INTRODUCTION,
W70-00528 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 2 RIGHTS IN DEFINED WATERBODIES BASIC CONSIDERATIONS,
W70-00529 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 3 OWNERSHIP OF UPLAND AS THE SOURCE OF RIPARIAN RIGHTS,
W70-00530 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 4 NONCONSUMPTIVE USES OF NATURAL NAVIGABLE WATERBODIES,
W70-00531 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 5 CONSUMPTIVE USE OF WATER COMMON LAW RULES,
W70-00532 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 6 STATUTORY MODIFICATIONS OF EASTERN CONSUMPTIVE USE DOCTRINES,
W70-00533 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 7 RIGHTS IN DISPOSAL OF DIFFUSED SURFACE WATER,
W70-00534 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 8 FEDERAL AUTHORITY AND ACTIVITY AFFECTING FLORIDA'S WATER RESOURCES,
W70-00535 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 9 STATE ADMINISTRATION OF WATER RESOURCES IN FLORIDA,
W70-00536 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 10 SINGLE PURPOSE AND MULTIPURPOSE WATER MANAGEMENT DISTRICTS,
W70-00537 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 11 THE LAW AND ADMINISTRATION OF POLLUTION CONTROL IN FLORIDA,
W70-00538 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 12 TITLE TO BEDS UNDER NAVIGABLE WATERS,
W70-00539 06E

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE CHAPTER 13 A LOOK TO THE FUTURE,
W70-00540 04A

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY). LAND AND WATER DEVELOPMENT DIV. CALIFORNIA UNIV., LOS ANGELES. WATER RESOURCES CENTER AND INTERNATIONAL STUDY CENTER FOR SPRINKLER IRRIGATION, VERONA (ITALY).
SPRINKLER IRRIGATION,
W70-00695 03F

FOREST SERVICE (USDA), ALBUQUERQUE, N. MEX. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
ESTABLISHMENT AND SURVIVAL OF SEVERAL GRASSES IN THE SAGEBRUSH TYPE, WEST-CENTRAL NEW MEXICO,
W70-00762 04D

FOREST SERVICE (USDA), BERKELEY, CALIF. PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION.
SNOWPACK MANAGEMENT,
W70-00763 02C

FOREST SERVICE (USDA), FORT COLLINS, COLO. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
MEASURING ANGLES WITH A CARPENTER'S FOLDING RULER,
W70-00760 07B

FOREST SERVICE (USDA), GRAND RAPIDS, MINN. NORTHERN CONIFERS LAB.
RUNOFF FROM SMALL PEATLAND WATERSHEDS,
W70-00675 02E

FOREST SERVICE (USDA), ST. PAUL, MINN. NORTH CENTRAL FOREST EXPERIMENT STATION.
PHYSICAL PROPERTIES OF PEATS AS RELATED TO DEGREE OF DECOMPOSITION,
W70-00761 02G

GEOLOGICAL SURVEY OF CANADA, OTTAWA (ONTARIO).
THE USE OF RADON-222 IN SURFACE WATERS IN GEOCHEMICAL PROSPECTING FOR URANIUM,
W70-00421 02J

GEOLOGICAL SURVEY OF NEW ZEALAND, CHRISTCHURCH. SEDIMENTATION LAB.
ENVIRONMENTALLY SIGNIFICANT SEDIMENTOLOGIC CHARACTERISTICS OF BEACH SANDS,
W70-00650 02L

GEOLOGICAL SURVEY, ALBANY, N.Y.
RESULTS OF SUBSURFACE EXPLORATION IN THE MID-ISLAND AREA OF WESTERN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
W70-00455 02F

A RECONNAISSANCE OF STREAM SEDIMENT IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00466 02J

GROUNDWATER RESOURCES OF THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00687 02F

CHEMICAL QUALITY OF STREAMS IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00688 02K

SURFACE WATER IN THE ERIE-NIAGARA BASIN, NEW YORK,
W70-00689 02E

GEOLOGICAL SURVEY, PHOENIX, ARIZ.

GROUND-WATER CONDITIONS IN MCMULLEN VALLEY, MARICOPA, YUMA AND YAVAPAI COUNTIES, ARIZONA,
W70-00426 02F

GEOLOGICAL SURVEY, TACOMA, WASH.
THREE-DIMENSIONAL SURGES AND RECOVERIES IN A NUMERICAL GLACIER MODEL,
W70-00443 02C

GEOLOGICAL SURVEY, TRENTON, N.J.
GROUNDWATER RESOURCES OF MONMOUTH COUNTY, NEW JERSEY,
W70-00465 02F

GEOLOGICAL SURVEY, WASHINGTON, D.C.
STAGE-DISCHARGE CHARACTERISTICS OF A WEIR IN A SAND-CHANNEL STREAM,
W70-00418 02E

ESTUARINE STUDIES IN UPPER GRAYS HARBOR, WASHINGTON,
W70-00419 02L

WATER RESOURCES OF RANDOLPH AND LAWRENCE COUNTIES, ARKANSAS,
W70-00420 02E

GENERALIZATION OF STREAMFLOW CHARACTERISTICS FROM DRAINAGE BASIN CHARACTERISTICS,
W70-00440 02E

LIMESTONE HYDROLOGY IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
W70-00451 02F

SURFACE-WATER RESOURCES OF THE YOBE RIVER SYSTEM, NORTHERN NIGERIA, 1963-68,
W70-00456 02A

HYDROLOGIC EFFECTS OF THE EARTHQUAKE OF MARCH 27, 1964, OUTSIDE ALASKA,
W70-00467 02E

GROUNDWATER RECONNAISSANCE IN THE BURNT RIVER VALLEY AREA, OREGON,
W70-00468 02F

CORRELATION AND ANALYSIS OF WATER-TEMPERATURE DATA FOR OREGON STREAMS,
W70-00470 02E

SURFACE WATER AND RELATED CLIMATE FEATURES OF THE SAHIL SUSAH AREA, TUNISIA,
W70-00471 02E

AVAILABILITY OF GROUND WATER IN YORK COUNTY, NEBRASKA,
W70-00472 02F

DETERMINATION OF PHENOXY ACID HERBICIDES IN WATER BY ELECTRON-CAPTURE AND MICROCOULOMETRIC GAS CHROMATOGRAPHY,
W70-00473 05A

HYDROLOGIC DATA FOR THE OAK RIDGE AREA, TENNESSEE,
W70-00476 02E

GROUNDWATER RESOURCES OF THE PASCAGOULA RIVER BASIN, MISSISSIPPI AND ALABAMA,
W70-00477 02F

IMPLICATIONS OF THE MINOR ELEMENT CONTENT OF SOME MAJOR STREAMS OF THE WORLD,
W70-00478 02K

PANEL DISCUSSION ON WATER QUALITY,
W70-00505 06B

OPTICAL METHOD FOR DETERMINING PARTICLE SIZES OF COARSE SEDIMENT,
W70-00655 02J

GEOLOGICAL SURVEY, WASHINGTON, D.C. AND GEOLOGICAL SURVEY, RALEIGH, N.C.
HYDROLOGY OF CARBONATE ROCK TERRANES, A REVIEW-WITH SPECIAL REFERENCE TO THE UNITED STATES (PART 1),
W70-00454 02F

GEORGE WASHINGTON UNIV., WASHINGTON, D.C.
EXPERIMENTAL DISSOLUTION OF CALCIUM, MAGNESIUM, AND STRONTIUM FROM RECENT BIOGENIC CARBONATES A MODEL OF DIAGENESIS,
W70-00444 02K

FEDERAL NATURAL RESOURCES DEVELOPMENT BASIC ISSUES IN BENEFIT AND COST MEASUREMENT,
W70-00494 06B

GUELPH UNIV. (ONTARIO). DEPT. OF SOIL SCIENCE.
NITROGEN CONTAMINATION OF GROUNDWATER BY BARNYARD LEACHATES,
W70-00665 05B

HARVARD UNIV., CAMBRIDGE, MASS.
MEASURING BENEFITS OF GOVERNMENT INVESTMENTS.
W70-00622 06B

HAWAII UNIV., HONOLULU.
HYDROGRAPH STUDY AND PEAK DISCHARGE DETERMINATION OF HAWAIIAN SMALL WATERSHEDS ISLAND OF OAHU,
W70-00449 02A

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
ANNUAL REPORT 1968-1969.
W70-00764 04D

ICELAND UNIV., REYKJAVIK. SCIENCE INST.
THE EXCHANGE OF HYDROGEN ISOTOPES BETWEEN ICE AND WATER IN TEMPERATURE GLACIERS,
W70-00439 02K

IDAHO UNIV., MOSCOW. WATER RESOURCES RESEARCH INST.
HYDROLOGY OF FROZEN GROUND FLOODS,
W70-00721 02C

SOCIAL PROBLEMS NEEDING SOLUTIONS, STATE AGENCIES,
W70-00758 06B

ILLINOIS DEPT. OF REGISTRATION AND EDUCATION, URBANA.
COST OF MUNICIPAL SEWAGE TREATMENT,
W70-00493 05D

ILLINOIS GEOLOGICAL SURVEY.
WATER RESOURCE INFORMATION FOR PLANNING AND MANAGEMENT,
W70-00515 06B

ILLINOIS STATE BAR ASSOCIATION.
ILLINOIS DRAINAGE LAW (A COMMENTARY),
W70-00815 04A

ILLINOIS STATE BOARD OF ECONOMIC DEVELOPMENT.
THE ILLINOIS STATE PLANNING PROGRAM,
W70-00753 06B

ILLINOIS PLANNING STUDIES AND COORDINATING ACTIVITIES,
W70-00754 06B

ILLINOIS UNIV., URBANA AND INTERNATIONAL RICE RESEARCH INST., LOS BANOS (PHILIPPINES).
REGIONAL DIFFERENCES IN THE IMPACT OF IRRIGATION ON FARM OUTPUT,
W70-00624 03F

ILLINOIS UNIV., URBANA. DEPT. OF MECHANICAL ENGINEERING.
FLUID DYNAMICS OF MULTIPHASE SYSTEMS,
W70-00469 02F

INSTITUTE OF PUBLIC ADMINISTRATION, WASHINGTON, D.C. AND NATIONAL PLANNING ASSOCIATION, WASHINGTON, D.C.
OUTDOOR RECREATION,
W70-00623 06B

IOWA STATE UNIV., AMES. DEPT. OF EARTH SCIENCES.
GEOLOGY OF THE REGOLITH AQUIFERS OF THE NISHNABOTNA BASIN,
W70-00458 02F

IRRIGATION RESEARCH INST., LAHORE (PAKISTAN).
AN INEXPENSIVE METHOD FOR DETERMINING THE DIRECTION OF NATURAL FLOW OF GROUNDWATER,
W70-00635 02F

KAZAN STATE UNIV. (USSR). DEPT. OF GEOGRAPHY.
DIFFERENTIAL EQUATION OF THE EVOLUTION OF DELUVIAL SLOPES (IN RUSSIAN),
W70-00648 02J

KENTUCKY UNIV., LEXINGTON.
ECONOMIC ANALYSIS OF ALTERNATIVE FLOOD CONTROL MEASURES BY DIGITAL COMPUTER,
W70-00617 06A

LIBRARY OF CONGRESS, WASHINGTON, D.C. SCIENCE AND TECHNOLOGY DIV.
AIR POLLUTION PUBLICATIONS - A SELECTED BIBLIOGRAPHY WITH ABSTRACTS, 1966-1968.
W70-00452 05G

LONG BEACH DEPT. OF OIL PROPERTIES, CALIF.
REDUCING LAND SUBSIDENCE IN THE WILMINGTON OIL FIELD BY THE USE OF SALINE WATERS,
W70-00447 05G

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF METEOROLOGY.
AN EXPERIMENTAL IN SITU DENSITOMETER,
W70-00462 07B

MCMASTER UNIV., HAMILTON (ONTARIO). DEPT. OF GEOGRAPHY AND WATERLOO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.
WATER BUDGET STUDIES IN KARST AQUIFERS,
W70-00676 02F

MIAMI UNIV., FLA. INST. OF MARINE SCIENCE.
THE UPTAKE, ACCUMULATION AND EXCHANGE OF STRONTIUM-90 BY OPEN SEA PHYTOPLANKTON,
W70-00707 05C

MICHIGAN STATE UNIV., EAST LANSING.
PERSPECTIVES ON ENVIRONMENTAL PLANNING AND RESOURCE DEVELOPMENT,
W70-00510 06B

MICHIGAN UNIV., ANN ARBOR. DEPT. OF CONSERVATION AND MICHIGAN UNIV., ANN ARBOR. INST. OF SCIENCE AND TECHNOLOGY.
WATER-RELATED RESEARCH FOR THE GREAT LAKES REGION,
W70-00433 02H

MINISTRY OF AGRICULTURE AND WATER, RIYADH (SAUDI ARABIA).
THE PROPOSED SOLWAY FIRTH BARRAGES A REVIEW OF THE GEOLOGICAL AND GEOTECHNICAL ASPECTS,
W70-00646 04A

MINNESOTA UNIV., ST. PAUL. AGRICULTURE EXTENSION SERVICE.
UNDERSTANDING THE WATER QUALITY CONTROVERSY IN MINNESOTA,
W70-00430 05G

MISSOURI UNIV., KANSAS CITY. DEPT. OF CHEMISTRY.
RADIOMETRIC AND SPECTROPHOTOMETRIC DETERMINATION OF TRACE

AMOUNTS OF SELENIUM USING 3, 3' -DIAMINOBENZIDINE AS THE INITIAL REAGENT,
W70-00460 05A

MOSCOW STATE UNIV. (USSR).
CALCULATION OF SEDIMENT BALANCE OF THE LITTORAL ZONE (IN RUSSIAN),
W70-00649 02L

AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN LANDSCAPE-GEOMORPHOLOGICAL FACTORS AND SEDIMENT RUNOFF OF THE RIVERS OF THE WESTERN TRANSCAUCASUS (IN RUSSIAN),
W70-00656 02J

MOSCOW STATE UNIV. (USSR). DEPT. OF METEOROLOGY AND MOSCOW STATE UNIV. (USSR). DEPT. OF CLIMATOLOGY.
THE USE OF EXPONENTIAL FUNCTIONS WHEN CONSTRUCTING THE LAWS OF THE DISTRIBUTION OF GEOGRAPHICAL AND HYDROMETEOROLOGICAL PARAMETERS (IN RUSSIAN),
W70-00657 02A

NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL, WASHINGTON, D.C.
LAND USE ALONG A TROPICAL CLIMATIC BOUNDARY THE WALAWE GANGA BASIN OF CEYLON,
W70-00463 03B

NATIONAL BUREAU OF ECONOMIC RESEARCH, NEW YORK.
ANTICIPATING THE NATIONS NEED FOR ECONOMIC KNOWLEDGE,
W70-00620 6B

NATIONAL INST. OF OCEANOGRAPHY, WORMLEY (ENGLAND).
DIRECT ILLUSTRATION OF ONE WAY SAND TRANSPORT BY TIDAL CURRENTS,
W70-00436 02J

NATIONAL PLANNING ASSOCIATION, WASHINGTON, D.C. CENTER FOR TECHNO-ECONOMIC STUDIES.
THE ROLE OF MARINE SCIENCES IN THE MULTIPLE USES OF THE COASTAL ZONE OF LAKE ERIE AND LAKE SUPERIOR,
W70-00457 02L

NEBRASKA UNIV., LINCOLN.
ENGINEERING PHASES OF LAND TREATMENT RELATED TO INCREASING WATER-USE EFFICIENCY AND STORAGE EFFICIENCY RAINFALL,
W70-00448 04A

AGRICULTURAL METEOROLOGY IN ISRAEL,
W70-00691 03F

NEBRASKA UNIV., LINCOLN. AGRICULTURAL EXPERIMENT STATION AND NEBRASKA UNIV., LINCOLN. DEPT. OF HORTICULTURE AND FORESTRY.
ADVECTIVE CONTRIBUTION OF ENERGY UTILIZED IN EVAPOTRANSPIRATION BY ALFALFA IN THE EAST CENTRAL GREAT PLAINS (U.S.A.),
W70-00690 02D

NEBRASKA UNIV., LINCOLN. COLL. OF AGRICULTURE AND HOME ECONOMICS AND NEBRASKA UNIV., AGRICULTURAL EXPERIMENT STATION.
RESEARCH IN EVAPOTRANSPIRATION,
W70-00450 02D

NETHERLANDS SCHOOL OF ECONOMICS, ROTTERDAM.
EFFICIENCY IN GOVERNMENT SPENDING,
W70-00615 06B

NEVADA FISH AND GAME DEPT., RENO AND CALIFORNIA STATE DEPT. OF FISH AND GAME, SACRAMENTO. INLAND FISHERIES BRANCH.
OBSERVATIONS ON DEEPWATER PLANTS IN LAKE TAHOE, CALIFORNIA AND NEVADA,
W70-00711 02H

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF ZOOLOGY.
GROWTH AND RESISTANCE TO STRESS IN BROOK TROUT FED SUBLETHAL LEVELS OF DDT,
W70-00684 05C

NEW YORK STATE DEPT. OF HEALTH, ALBANY. BUREAU OF RADIOLOGICAL HEALTH.
ENVIRONMENTAL SURVEILLANCE AROUND A NUCLEAR FUEL REPROCESSING INSTALLATION, 1965-1967,
W70-00677 05C

NEW ZEALAND OCEANOGRAPHIC INST., WELLINGTON. DEPT. OF SCIENTIFIC AND INDUSTRIAL RESEARCH.
RECENT SEDIMENTATION AROUND NORTHERNMOST NEW ZEALAND,
W70-00645 02J

OFF-SHORE SEDIMENTS, NORTH-WEST NELSON, SOUTH ISLAND, NEW ZEALAND,
W70-00660 02L

THE APPEARANCE AND ORIGIN OF COLOURS IN MUDDY MARINE SEDIMENTS AROUND NEW ZEALAND,
W70-00661 02L

NORTH CAROLINA STATE UNIV., RALEIGH AND CHASE MANHATTAN BANK, NEW YORK.
OPTIMAL WATER ALLOCATION THE NORTH PLATTE RIVER,
W70-00629 06D

NORTHWEST PULP AND PAPER ASSOCIATION.
PANEL DISCUSSION ON WATER QUALITY,
W70-00504 06B

NORTHWESTERN ILLINOIS PLANNING COMMISSION.
PLANNING FOR WATER RESOURCE DEVELOPMENT THE FORMULATION OF A STRATEGY,
W70-00512 06B

NORTHWESTERN UNIV., EVANSTON, ILL.
COMMENT ON THE PLACE OF WATER RESOURCES PLANNING IN ECONOMIC REGIONAL DEVELOPMENT,
W70-00614 06B

OBERLIN COLL., OHIO. DEPT. OF BIOLOGY.
COMPARATIVE ECOLOGY OF SANDSPIT PONDS,
W70-00671 02L

OHIO STATE UNIV., COLUMBUS TEXAS A AND M UNIV., COLLEGE STATION AND WRIGHT STATE UNIV., FAIRBORN, OHIO.
SPATIAL BEHAVIOR IN RECREATIONAL BOATING,
W70-00601 06D

OHIO STATE UNIV., COLUMBUS.
PLANT SIZING FOR A SEASONAL PRODUCT DEMAND USING A LINEAR PROGRAMMING MODEL,
W70-00604 06A

OREGON STATE UNIV., CORVALLIS AND NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
THERMAL STRATIFICATION IN THE ARCTIC OCEAN,
W70-00638 02C

OREGON STATE UNIV., CORVALLIS.
SOME OBSERVATIONS ON ECONOMIC EVALUATION STUDIES,
W70-00499 06C

PANEL DISCUSSION ON WATER QUALITY CONTROL,
W70-00502 06B

OREGON STATE UNIV., CORVALLIS. DEPT. OF FISHERIES AND WILDLIFE.
ACCUMULATION OF DIELDRIN BY FISH AND SELECTED FISH-FOOD ORGANISMS,
W70-00714 05C

OREGON STATE WATER RESOURCES BOARD.
OREGON STATE INTEREST AND VIEWPOINT IN RIVER BASIN PLANNING IN THE WILLAMETTE COMPREHENSIVE STUDY,
W70-00509 06E

OREGON UNIV., EUGENE.
FORECASTING REGIONAL ECONOMIC GROWTH SOME PROBLEMS AND PITFALLS,
W70-00498 06B

OTAGO UNIV., DUNEDIN (NEW ZEALAND). DEPT. OF GEOGRAPHY.
EARTHFLOW OCCURRENCE DURING HIGH INTENSITY RAINFALL IN EASTERN OTAGO (NEW ZEALAND),
W70-00647 02B

PENNSYLVANIA GEOLOGICAL SURVEY, HARRISBURG.
STRATIGRAPHY AND SEDIMENTOLOGY OF THE TERTIARY ROCKS OF THE MANDAMUS-DOVE RIVER AREA, NORTH CANTERBURY, NEW ZEALAND,
W70-00644 02J

PENNSYLVANIA UNIV., PHILADELPHIA. UNIV. MUSEUM.
A DIVERSIFIED PROGRAM FOR THE STUDY OF SHALLOW WATER SEARCHING AND MAPPING TECHNIQUES,
W70-00461 07B

PRINCETON UNIV., N.J. DEPT. OF ECONOMICS.
GOVERNMENT RESEARCH AND DEVELOPMENT PROGRAMS,
W70-00621 06B

PUBLIC HEALTH SERVICE, WASHINGTON, D.C.
A CLIMATOLOGICAL EVALUATION OF PRECIPITATION PATTERNS,
W70-00740 04C

PURDUE UNIV., LAFAYETTE, IND.
ERODIBILITY OF SAND-CLAY MIXTURES AS EVALUATED BY A WATER JET,
W70-00724 02J

STATISTICAL ANALYSIS OF MEANDERING RIVER GEOMETRY,
W70-00725 02E

RAND WATER BOARD, JOHANNESBURG (SOUTH AFRICA).
OPTIMUM ALLOCATION OF WATER RESOURCES BY MATHEMATICAL PROGRAMMING,
W70-00641 06A

RESOURCES FOR THE FUTURE, INC., WASHINGTON, D.C.
EFFLUENT CHARGES,
W70-00489 05G

RESEARCH GOALS AND PROGRESS TOWARD THEM,
W70-00619 05G

THE WATER RESOURCES OF CHILE AN ECONOMIC METHOD FOR ANALYZING A KEY RESOURCE IN A NATION'S DEVELOPMENT,
W70-00699 06B

RHODE ISLAND UNIV., KINGSTON. NARRAGANSETT MARINE LAB.
SEASONAL SELECTION OF ESTUARINE BACTERIA BY WATER TEMPERATURE,
W70-00713 05C

ROCKETDYNE, CANOGA PARK, CALIF. RESEARCH DIV.
MONITORING INDUSTRIAL POLLUTANTS BY THE PYROLYSIS-METHANE DETECTION METHOD,
W70-00682 05B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF GEOLOGY.
HYDROLOGY OF SOUTH BONAIRE, N. A. - A ROCK SELECTIVE DOLOMITIZATION MODEL,
W70-00441 02F

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF MECHANICAL AND AEROSPACE ENGINEERING.
LAWS OF DISPERSION,
W70-00732 01A

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. WATER RESOURCES RESEARCH INST.
OPTIMUM INESTMENT IN STRUCTURAL FLOOD CONTROL,
W70-00729 06B

SAN DIEGO, CALIF.
CONTROLLING ACCIDENT COMPENSATION COSTS,
W70-00598 06C

SHELL DEVELOPMENT CO., HOUSTON, TEX. EXPLORATION AND PRODUCTION RESEARCH DIV. AND JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF GEOLOGY.
ANATOMY OF A MODERN CARBONATE TIDAL-FLAT, ANDROS ISLAND, BAHAMAS,
W70-00445 02J

SOIL CONSERVATION SERVICE, CHICKASHA, OKLA. SOUTHERN PLAINS BRANCH AND GEORGIA INST. OF TECH., ATLANTA. SCHOOL OF CIVIL ENGINEERING.
COMPUTER-ORIENTED METHOD OF OPTIMIZING HYDROLOGIC MODEL PARAMETERS,
W70-00642 06A

SOUTH DAKOTA STATE UNIV., BROOKINGS. COLL. OF AGRICULTURE AND BIOLOGICAL SCIENCES.
ECONOMIC EFFECTS OF USING SUBSTANDARD QUALITY WATER IN WEBSTER AND OTHER COMMUNITIES IN SOUTH DAKOTA.
W70-00727 03C

STANFORD UNIV., CALIF. DEPT. OF CIVIL ENGINEERING.
THE USE OF INVERTEBRATES IN A WATER QUALITY INVESTIGATION A BIOLOGICAL STUDY OF THE MIAMI RIVER, OHIO,
W70-00475 05C

STANFORD UNIV., CALIF. DEPT. OF SANITARY ENGINEERING.
CHEMICAL PROCESSING OF WASTEWATER FOR NUTRIENT REMOVAL,
W70-00680 05D

STATE UNIV. OF NEW YORK, BUFFALO.
TAXATION AND THE DISPOSITION OF DEPRECIABLE ASSETS,
W70-00600 06C

STATE UNIV. OF NEW YORK, STONY BROOK. DEPT. OF EARTH AND SPACE SCIENCES.
OCEANIC CONCENTRATIONS OF RADIUM-228,
W70-00435 02K

SYRACUSE UNIV. RESEARCH CORP., N.Y.
APPLICATION OF AN AIRBORNE PULSED LASER FOR NEAR SHORE BATHYMETRIC MEASUREMENTS,
W70-00636 07B

TALLINN POLYTECHNIC INST. (USSR).
AN EXPERIMENTAL RESEARCH OF COEFFICIENT OF LONGITUDINAL DISPERSION FOR SMALL RIVERS (IN RUSSIAN),
W70-00743 05B

TECHNICAL SCHOOL, NIS (YUGOSLAVIA).
EFFECT OF PHOTOSYNTHESIS ON OXYGEN SATURATION,
W70-00683 05C

TENNESSEE RECHNOLOGICAL UNIV., COOKEVILLE. DEPT. OF BIOLOGY.
A LIMNOLOGICAL STUDY OF A TENNESSEE COLD SPRINGBROOK,
W70-00672 02I

TENNESSEE VALLEY AUTHORITY, KNOXVILLE. DIV. OF FORESTRY DEVELOPMENT.
FISH AND FISHING AROUND TVA STEAM PLANTS.
W70-00749 05C

TENNESSEE VALLEY AUTHORITY, MUSCLE SHOALS, ALA. SOILS AND FERTILIZER RESEARCH BRANCH.
EFFECTS OF FERTILIZERS ON WATER QUALITY.
W70-00717 05C

TENNESSEE VALLEY AUTHORITY, WASHINGTON, D.C.
BENEFIT-COST ANALYSIS FOR WATER RESOURCE PROJECTS A SELECTED ANNOTATED BIBLIOGRAPHY,
W70-00495 06B

TEXAS A AND M UNIV., COLLEGE STATION. WATER RESOURCES INST.
A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH VALIDITY TESTING OF A COMPARATIVE-PROJECTOR MODEL,
W70-00479 06A

INSTITUTIONAL FACTORS AND THE TEXAS WATER PLAN,
W70-00492 06B

TULSA UNIV., OKLA.
GRAIN SIZE DISTRIBUTIONS AND DEPOSITIONAL PROCESSES,
W70-00639 02J

UNITED STATES STEEL CORP., LORAIN, OHIO. TOOLING AND METHODS TUBULAR PRODUCTS WORKS.
RECOVERY OF WASTE OIL USING FLOATING-TYPE SKIMMERS,
W70-00686 05D

UTAH STATE UNIV., LOGAN.
RESEARCH PERSPECTIVE FOR SOCIOLOGICAL PROBLEMS INVOLVING WATER RESOURCES,
W70-00755 06B

WATER FOR PEOPLE,
W70-00756 06B

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
THE EFFECTS OF THERMAL EFFLUENTS ON MARINE ORGANISMS,
W70-00747 05C

VIRGINIA POLYTECHNIC INST., BLACKSBURG. DEPT. OF ECONOMICS.
PUBLIC VS. PRIVATE GOODS,
W70-00491 05G

VIRGINIA POLYTECHNIC INST., BLACKSBURG. DONALDSON BROWN CONTINUING EDUCATION CENTER.
ECONOMICS OF AIR AND WATER POLLUTION.
W70-00486 05G

VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ECONOMICS.
COST-BENEFIT ANALYSIS SELECTED ISSUES,
W70-00487 05G

VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF GEOLOGY VIRGINIA HIGHWAY RESEARCH COUNCIL, CHARLOTTESVILLE AND CITIES SERVICE OIL CO., TULSA, OKLA.
PORE STUDIES OF HIGHLY INDURATED APPALACHIAN ROCKS,
W70-00659 02F

WARSAW UNIV. (POLAND). FACULTY OF GEOPHYSICS.
A NOTE ON THE DEPENDENCE BETWEEN THE CONCENTRATION OF CHLORIDE IONS AND THE RADIOACTIVITY OF EMANATION DISSOLVED IN MINERAL WATERS (IN POLISH),
W70-00668 05A

WASHINGTON UNIV., SEATTLE.
SOME PROBLEMS IN EVALUATION OF WATER RESOURCES,
W70-00500 06C

BACTERIOLOGICAL EFFECT OF SMALL BOAT WASTES ON SMALL HARBORS,
W70-00722 05C

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
PHYSICAL INFLUENCES ON FLOW SERIAL CORRELATION,
W70-00723 02E

WASHINGTON UNIV., SEATTLE. DEPT. OF GEOLOGY AND WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOLOGY.
CHARACTERISTICS OF COLUMBIA RIVER SEDIMENT AND SEDIMENT TRANSPORT,
W70-00446 02J

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
QUANTITATIVE STATISTICAL ANALYSES OF COLUMBIA RIVER SEDIMENT SAMPLES,
W70-00438 02J

WASHINGTON UNIV., ST. LOUIS, MO.
PRESSURES OF GROWTH UPON ENVIRONMENT,
W70-00618 06G

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
SEWAGE FUNGUS ITS NATURE AND EFFECTS,
W70-00637 05C

THE EFFECT OF TEMPERATURE ON THE ACUTE TOXICITY OF PHENOL TO RAINBOW TROUT IN HARD WATER,
W70-00746 05C

WISCONSIN STATE UNIV., SUPERIOR.
THE FOREST VEGETATION OF THE BRULE RIVER BASIN, WISCONSIN, TRIBUTARY TO LAKE SUPERIOR,
W70-00765 02I

WISCONSIN UNIV., MADISON.
POSSIBILITIES OF MAJOR CLIMATIC MODIFICATION AND THEIR IMPLICATIONS NORTHWEST INDIA, A CASE FOR STUDY,
W70-00702 02B

THE CONSTITUTIONALITY OF EFFLUENT CHARGES,
W70-00766 05G

SELECTED WATER RESOURCES INDEX FOR WISCONSIN,
W70-00767 10

WISCONSIN UNIV., MADISON. DEPT. OF BOTANY.
THE ISOLATION, PURIFICATION, AND NUTRIENT SOLUTION REQUIREMENTS OF BLUE-GREEN ALGAE,
W70-00719 05C

WISCONSIN UNIV., MADISON. DEPT. OF METEOROLOGY.
EVAPOTRANSPIRATION CLIMATONOMY 1. A NEW APPROACH TO NUMERICAL PREDICTION OF MONTHLY EVAPOTRANSPIRATION, RUNOFF, AND SOIL MOISTURE STORAGE,
W70-00654 02D

WISCONSIN UNIV., MILWAUKEE. DEPT. OF BOTANY.
ECOLOGICAL FACTORS AND THE DISTRIBUTION OF CLADOPHORA GLOMERATA IN THE GREAT LAKES,
W70-00667 05C

WYANDOTTE CHEMICAL CORP., MICH.
BACTERIA, CARBON DIOXIDE, AND ALGAL BLOOMS,
W70-00664 05C

WYOMING UNIV., LARAMIE.
SNOWY RANGE WATER RESOURCE OBSERVATORY (A PROGRESS REPORT).
W70-00480 07C

YALE UNIV., NEW HAVEN, CONN.
ALLOCATION OF RESOURCES AND THE PRICE SYSTEM,
W70-00631 06B

THE INTERACTION OF TOOLS AND PROBLEMS IN ECONOMICS,
W70-00632 06B

ACCESSION NUMBER INDEX

02E	W70-00418
02L	W70-00419
02E	W70-00420
02J	W70-00421
02J	W70-00422
02H	W70-00423
02H	W70-00424
02K	W70-00425
02F	W70-00426
05A	W70-00427
02K	W70-00428
02K	W70-00429
05G	W70-00430
06E	W70-00431
06E	W70-00432
02H	W70-00433
02K	W70-00434
02K	W70-00435
02J	W70-00436
04A	W70-00437
02J	W70-00438
02K	W70-00439
02E	W70-00440
02F	W70-00441
02J	W70-00442
02C	W70-00443
02K	W70-00444
02J	W70-00445
02J	W70-00446
05G	W70-00447
04A	W70-00448
02A	W70-00449
02D	W70-00450
02F	W70-00451
05G	W70-00452
02J	W70-00453
02F	W70-00454
02F	W70-00455
02A	W70-00456
02L	W70-00457
02F	W70-00458
02G	W70-00459
05A	W70-00460
07B	W70-00461
07B	W70-00462
03B	W70-00463
07B	W70-00464
02F	W70-00465
02J	W70-00466
02E	W70-00467
02F	W70-00468
02F	W70-00469
02E	W70-00470
02E	W70-00471
02F	W70-00472
05A	W70-00473
07A	W70-00474
05C	W70-00475
02E	W70-00476
02F	W70-00477
02K	W70-00478
06A	W70-00479
07C	W70-00480
10	W70-00481
10	W70-00482
07A	W70-00483
02G	W70-00484
04A	W70-00485
05G	W70-00486
05G	W70-00487
05G	W70-00488
05G	W70-00489
05G	W70-00490
05G	W70-00491
06B	W70-00492
05D	W70-00493
06B	W70-00494
06B	W70-00495
06E	W70-00496
06B	W70-00497
06B	W70-00498
06C	W70-00499
06C	W70-00500
06B	W70-00501
06B	W70-00502
06B	W70-00503
06B	W70-00504
06B	W70-00505
06B	W70-00506
06B	W70-00507
06E	W70-00508
06E	W70-00509
06B	W70-00510
06B	W70-00511
06B	W70-00512
06B	W70-00513
06B	W70-00514
06B	W70-00515
06E	W70-00516
06E	W70-00517
06E	W70-00518
06E	W70-00519
05G	W70-00520
05G	W70-00521
06E	W70-00522
06E	W70-00523
06E	W70-00524
06E	W70-00525
06E	W70-00526
06E	W70-00527
06E	W70-00528
06E	W70-00529
06E	W70-00530
06E	W70-00531
06E	W70-00532
06E	W70-00533
06E	W70-00534
06E	W70-00535
06E	W70-00536
06E	W70-00537
06E	W70-00538
06E	W70-00539
04A	W70-00540
04D	W70-00541
05G	W70-00542
05G	W70-00543
05G	W70-00544
06E	W70-00545
06E	W70-00546
06E	W70-00547
04A	W70-00548
06E	W70-00549
06E	W70-00550
06E	W70-00551
06E	W70-00552
06E	W70-00553
04D	W70-00554
06E	W70-00555
06E	W70-00556
06E	W70-00557
06E	W70-00558
04A	W70-00559
06E	W70-00560
04A	W70-00561
04A	W70-00562
04A	W70-00563
04A	W70-00564
06E	W70-00565
04A	W70-00566
04A	W70-00567
04A	W70-00568
04A	W70-00569
04A	W70-00570
03F	W70-00571
04A	W70-00572
06E	W70-00573
06E	W70-00574
04A	W70-00575
06E	W70-00576
06E	W70-00577
05G	W70-00578
05G	W70-00579
05G	W70-00580
06E	W70-00581
06E	W70-00582
04C	W70-00583
06E	W70-00584
06E	W70-00585
06E	W70-00586
06E	W70-00587
06E	W70-00588
06E	W70-00589
04A	W70-00590
06E	W70-00591
06E	W70-00592
06E	W70-00593
04A	W70-00594
04A	W70-00595
04A	W70-00596
06C	W70-00597
06C	W70-00598
06E	W70-00599
06C	W70-00600
06D	W70-00601
06C	W70-00602
06G	W70-00603
06A	W70-00604
06G	W70-00605
06G	W70-00606
06G	W70-00607
06G	W70-00608
06G	W70-00609
06G	W70-00610
06G	W70-00611
06A	W70-00612
05G	W70-00613
06B	W70-00614
06B	W70-00615
06C	W70-00616
06A	W70-00617
06G	W70-00618
05G	W70-00619
6B	W70-00620
06B	W70-00621
06B	W70-00622
06B	W70-00623
03F	W70-00624
06F	W70-00625
06C	W70-00626
03F	W70-00627
06C	W70-00628
06D	W70-00629
06B	W70-00630
06B	W70-00631
06B	W70-00632
06C	W70-00633
06D	W70-00634
02F	W70-00635
07B	W70-00636
05C	W70-00637
02C	W70-00638
02J	W70-00639
02L	W70-00640
06A	W70-00641
06A	W70-00642
02L	W70-00643
02J	W70-00644
02J	W70-00645
04A	W70-00646
02B	W70-00647
02J	W70-00648
02L	W70-00649
02L	W70-00650
02L	W70-00651
02J	W70-00652
02J	W70-00653
02D	W70-00654
02J	W70-00655
02J	W70-00656
02A	W70-00657
05D	W70-00658
02F	W70-00659
02L	W70-00660
02L	W70-00661
05D	W70-00662
04A	W70-00663
05C	W70-00664
05B	W70-00665
05B	W70-00666
05C	W70-00667
05A	W70-00668
02C	W70-00669
02K	W70-00670
02L	W70-00671
02I	W70-00672
02B	W70-00673
02K	W70-00674
02E	W70-00675
02F	W70-00676
05C	W70-00677
05G	W70-00678
04A	W70-00679
05D	W70-00680
05B	W70-00681
05B	W70-00682
05C	W70-00683
05C	W70-00684
05D	W70-00685
05D	W70-00686
02F	W70-00687
02K	W70-00688
02E	W70-00689
02D	W70-00690
03F	W70-00691
04B	W70-00692
06B	W70-00693
03A	W70-00694
03F	W70-00695
04A	W70-00696
06B	W70-00697
02E	W70-00698
06B	W70-00699
06G	W70-00700
03B	W70-00701
02B	W70-00702
04B	W70-00703
06B	W70-00704
03F	W70-00705
04B	W70-00706
05C	W70-00707
05C	W70-00708
05C	W70-00709
05C	W70-00710
02H	W70-00711
02H	W70-00712
05C	W70-00713
05C	W70-00714
04A	W70-00715
05B	W70-00716
05C	W70-00717

05C W70-00718
05C W70-00719
04A W70-00720
02C W70-00721
05C W70-00722
02E W70-00723
02J W70-00724
02E W70-00725
03A W70-00726
03C W70-00727
06F W70-00728
06B W70-00729
05G W70-00730
05B W70-00731
01A W70-00732
09D W70-00733
06E W70-00734
06E W70-00735
03F W70-00736
06E W70-00737
06E W70-00738
06E W70-00739
04C W70-00740
02D W70-00741
05C W70-00742
05B W70-00743
02D W70-00744
05D W70-00745
05C W70-00746
05C W70-00747
05C W70-00748
05C W70-00749
06B W70-00750
06B W70-00751
06B W70-00752
06B W70-00753
06B W70-00754
06B W70-00755
06B W70-00756
06B W70-00757
06B W70-00758
04A W70-00759
07B W70-00760
02G W70-00761
04D W70-00762
02C W70-00763
09D W70-00764
02I W70-00765
05G W70-00766
10 W70-00767
06B W70-00768
06D W70-00769
06E W70-00770
05G W70-00771
06E W70-00772
06E W70-00773
04B W70-00774
04A W70-00775
06E W70-00776
06E W70-00777
06E W70-00778
06E W70-00779
06E W70-00780
04A W70-00781
06E W70-00782
06B W70-00783
06B W70-00784
04A W70-00785
05G W70-00786
05B W70-00787
04A W70-00788
05C W70-00789
05G W70-00790
05G W70-00791
05G W70-00792
05G W70-00793
05G W70-00794
05A W70-00795
05D W70-00796
04A W70-00797
04A W70-00798
04A W70-00799
04A W70-00800
04A W70-00801
04A W70-00802
04A W70-00803
04A W70-00804
06C W70-00805
05G W70-00806
06E W70-00807
06E W70-00808
06E W70-00809
06E W70-00810
06E W70-00811
06E W70-00812
06E W70-00813
04A W70-00814
04A W70-00815
06E W70-00816
04A W70-00817
04A W70-00818
04A W70-00819
06E W70-00820
04A W70-00821
04A W70-00822
04A W70-00823
04A W70-00824
04A W70-00825
05G W70-00826
04A W70-00827
04A W70-00828
04A W70-00829
04A W70-00830
06E W70-00831
06E W70-00832
04A W70-00833
06E W70-00834
05G W70-00835

ABSTRACT SOURCES

Sources	Accession Numbers	Total
A. Centers of Competence		
University of Florida - Eastern U.S. Water Law	W70-00518 - 00595 00734 - 00739 00768 - 00835 00431, 00432, 00437, 00485, 00496, 00508, 00516, 00517, 00596, 00599, 00696, 00715, 00720, 00759	166
U.S. Geological Survey - Hydrology	W70-00418 - 00430 00433 - 00436 00438 - 00478 00635 - 00689	113
Rutgers - The State University - Water Resources Economics	W70-00486 - 00495 00597 - 00598 00600 - 00634 00728 - 00733	53
University of Wisconsin - Eutrophication	W70-00707 - 00714 00716 - 00719 00765 - 00767	15
University of Chicago - Metropolitan Water Resources Management	W70-00497 - 00507 00509 - 00515 00750 - 00758	27
Vanderbilt University - Thermal Pollution	W70-00740 - 00749	10
University of Arizona - Arid Lands Water Resources	W70-00690 - 00695 00697 - 00706	16
B. Others:		
Environmental Technical Applications Center (USAF)	W70-00481 - 00484	4
Forest Service (USDA)	W70-00760 - 00763	4
Office of Saline Water (USDI)	W70-00726 - 00727	2
Texas Water Resources Research Institute	W70-00479	1
Wyoming Water Resources Research Institute	W70-00480	1
Hawaii Water Resources Research Institute	W70-00764	1
Idaho Water Resources Research Institute	W70-00721	1
Washington Water Research Center	W70-00722 - 00723	2
Indiana Water Resources Research Center	W70-00724 - 00725	2
	Total	418

☆ U. S. GOVERNMENT PRINTING OFFICE : 1970 392-126/12

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE

LIBRARY RATE
PRINTED MATTER

U.S. DEPARTMENT OF COMMERCE
CLEARINGHOUSE FOR FEDERAL
SCIENTIFIC AND TECHNICAL INFORMATION
Springfield, Va. 22151

OFFICIAL BUSINESS